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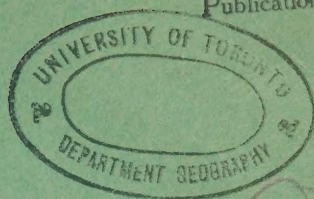
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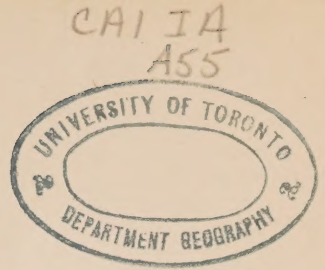
ANNUAL REPORT

DEPARTMENT OF Northern Affairs and National Resources

***Fiscal Year
1953 - 54***



CANADA



ANNUAL REPORT

DEPARTMENT OF Northern Affairs and National Resources

***Fiscal Year
1953 - 54***

Price 50 cents



*To His Excellency the Right Honourable Vincent Massey, C.H., Governor
General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the Annual Report of the Department of Northern Affairs and National Resources for the fiscal year ended March 31, 1954.

Respectfully submitted,

JEAN LESAGE,
*Minister of Northern Affairs and
National Resources.*

*The Honourable Jean Lesage,
Minister of Northern Affairs and National Resources,
Ottawa.*

SIR:

I have the honour to submit the First Annual Report of the Department of Northern Affairs and National Resources which covers the fiscal year ended on the 31st of March, 1954.

Your obedient servant,

R. G. ROBERTSON,
Deputy Minister.

DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES

Minister	Hon. Jean Lesage
Executive Assistant	P. Cimon

Deputy Minister's Office

Deputy Minister	R. G. Robertson
Assistant Deputy Minister	C. W. Jackson
Assistant Deputy Minister	M. Lamontagne*
Executive Officer	R. A. J. Phillips*
Secretary, Advisory Committee on Northern Development	G. W. Rowley

Northern Administration and Lands Branch

Director	F. J. G. Cunningham
Territorial Division	Chief—F. Fraser
Arctic Division	Chief—B. G. Sivertz*
Lands Division	Chief—C. K. LeCapelain

National Parks Branch

Director	J. A. Hutchison
National Parks and Historic Sites Division	Chief—J. R. B. Coleman
Wildlife Division	Chief—W. W. Mair
National Museum of Canada	Chief Curator—F. J. Alcock

Engineering and Water Resources Branch

Director	Norman Marr
Water Resources Division	Chief—T. M. Patterson
Engineering and Architectural Division	Chief—C. V. F. Weir

Forestry Branch

Director	D. A. Macdonald
Assistant Director	G. Tunstell
Forest Research Division	Chief—J. D. B. Harrison
Forestry Operations Division	Chief—H. W. Beall
Forest Products Laboratories Division	Chief—J. H. Jenkins

Canadian Government Travel Bureau

Director	D. Leo Dolan
Assistant Director	G. H. Ellis
Information Division	R. D. Palmer
Publicity Division	L. B. Connery
Films, Radio and Television Division	H. S. Robinson
Publications Division	J. G. Perdue

Administration Branch

Chief Administrative Officer	R. K. Odell
Editorial and Information Division	Chief—A. J. Baxter
Purchasing Division	A/Chief—L. A. Sherwood
Legal Division	Chief—W. Nason
Personnel Division	Chief—A. C. Wimberley
Economic Division	Chief—C. H. Herbert

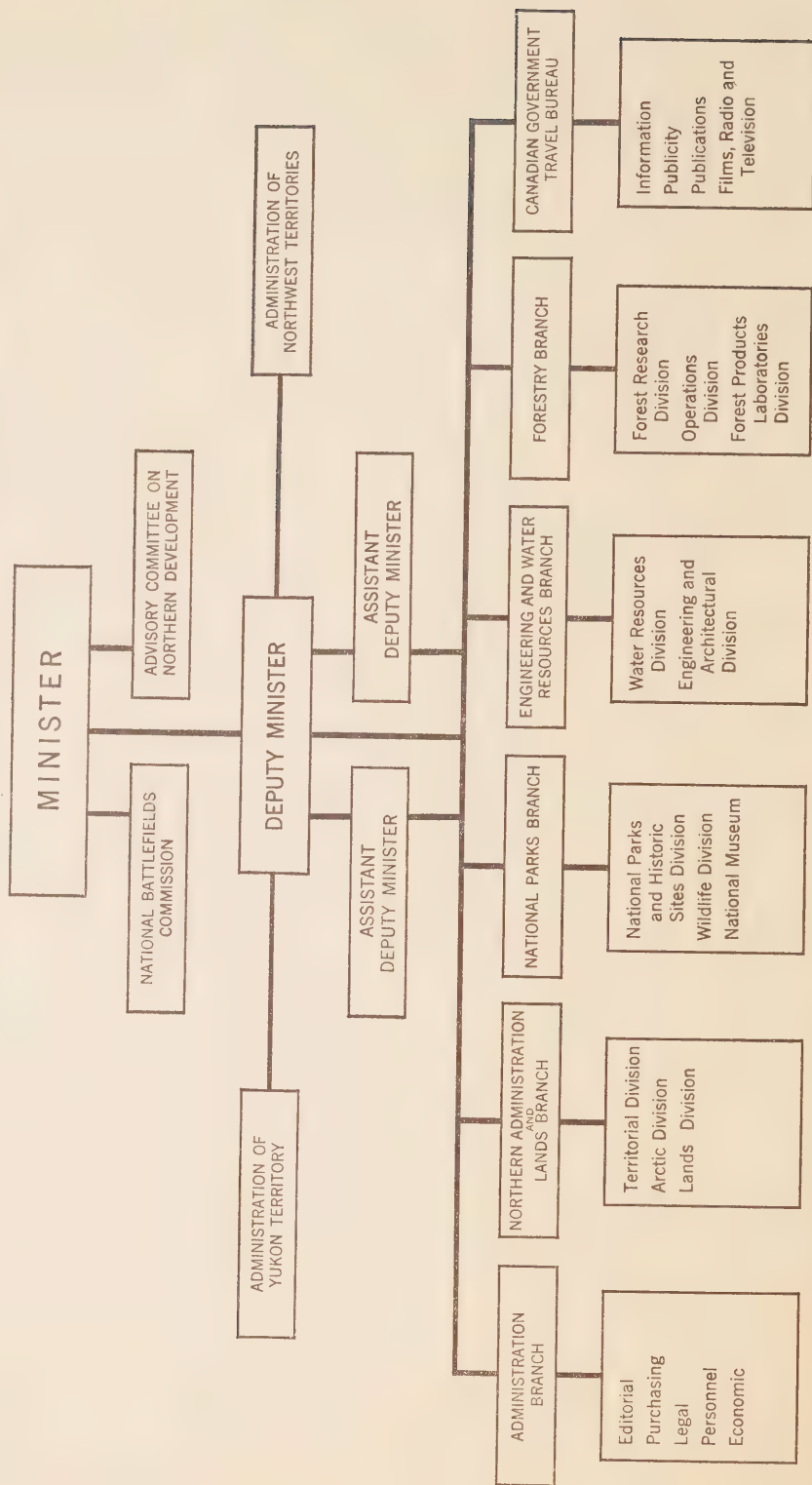
* Appointments made shortly after March 31, 1954.

CONTENTS

	PAGE
Introduction	9
Northern Administration and Lands Branch	11
Lands Division	12
Territorial Division	21
Arctic Division	26
National Parks Branch	33
National Parks and Historic Sites Division	33
Wildlife Division	49
National Museum of Canada	54
Engineering and Water Resources Branch	61
Water Resources Division	61
Engineering and Architectural Division	74
Forestry Branch	78
Forest Research Division	81
Forestry Operations Division	90
Forest Products Laboratories Division	95
Canadian Government Travel Bureau	109
Films, Radio and Television	110
Publicity	110
Information	111
Publications	111
Appendices	113
Appendix "A"—Report of the Commissioner, Northwest Territories.....	113
Appendix "B"—Report of the Commissioner, Yukon Territory.....	118

Inserted at the back of this Report is a map showing the location of national parks; game reserves; highway projects; forestry, water resources, wildlife, engineering and Northern Administration offices and posts, and other centres of departmental activity.

DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES



DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES

New definition was given to the work of the Department in the far north when, during the fiscal year, Parliament passed Bill No. 6, changing the name of the Department to Northern Affairs and National Resources.

In moving the second reading of the Bill the Prime Minister said that it was designed to give more emphasis to the fact that Canadians are greatly interested in their north and that they regard it as an important part of the territory subject to the sovereignty of the Canadian nation. The functions of the Department remain essentially the same but its responsibilities in relation to the north are more fully and clearly defined. The specific duty of the Minister is to co-ordinate the activities of all government departments in the Northwest Territories and in the Yukon. He is also responsible for promoting measures for further economic and political development in the Territories.

Economic activity in the Yukon and Northwest Territories continued to justify the country's accented interest. Increased gold production from the three producing mines in the Northwest Territories sent the value of mineral production to more than a million and a half dollars above the 1952 figure. In Yukon Territory, the value of minerals produced registered a rise of close to three million dollars over the previous year's total, principally on the strength of increased production of silver and lead.

In other fields, departmental engineers gave attention to the steady demand for road construction and improvement in the National Parks and for other engineering works in National Historic Parks, a demand that stems from the steadily increasing number of visitors to these parks. The supervision and construction of roads in the Yukon and Northwest Territories and accommodation required for educational services in the north was also carried out by the engineering service. Run-off conditions were well above normal during the year, and water-power development increased by more than four per cent, to bring the total to almost fifteen million horse power.

More than three million persons visited Canada's National Parks during the year, a record total that was more than 18 per cent above the number of visitors in the previous year. Travel to Canada generally was of record proportions, the number of individual entries and long-stay visiting automobiles being the highest to date.

In the field of forestry, an agreement was signed with New Brunswick in April, 1953, covering the experimental spraying against spruce budworms. In the first year, some 2,800 square miles were sprayed. In January, 1954, the Department arranged with the Department of National Defence to take over the protection and management of forests on the new 430-square mile Gagetown military area in New Brunswick.

Activities under agreements with the provinces respecting forest inventories and reforestation continued satisfactorily during the fiscal year. The area planted or seeded under the Canada Forestry Act now amounts to almost 37,000 acres, on which about 30 million trees have been planted. Two-thirds of the work involved in taking forest inventories has been completed.

Departmental revenues were higher in 1953-54 by about fifty thousand dollars and expenditures were down by more than 43 per cent, the latter because expenditures under the Trans-Canada Highway Act are now made by the Public Works Department.

The following table gives a summary of revenues and expenditures for the fiscal year:

	Revenues	*Expenditures
Administrative Offices	\$ 12 21	\$ 396,861 25
National Parks Branch		
Branch Administration		26,736 82
National Parks and Historic Sites	1,012,823 85	6,587,776 33
Grant to Jack Miner Migratory Bird Foundation		5,000 00
Grant in Aid of the Development of the International Peace Garden in Manitoba		9,975 90
Special Grant to the Antiquarian and Numismatic Society		40,000 00
National Battlefields Commission		108,501 75
Wildlife Division	3,863 88	324,095 44
National Museum	5,708 95	252,937 52
	<hr/> 1,022,396 68	<hr/> 7,355,023 76
Engineering and Water Resources Branch		
Branch Administration		49,041 75
Water Resources Division	153,691 04	956,216 36
Engineering and Architectural Division	380 76	647,163 89
	<hr/> 154,071 80	<hr/> 1,652,422 00
Northern Administration and Lands Branch		
Branch Administration		119,660 13
Lands Division	834,999 02	439,886 18
Territorial Division	125,902 83	2,925,742 57
	<hr/> 960,901 85	<hr/> 3,485,288 88
Forestry Branch		
Branch Administration		109,634 42
Forest Research Division	18,356 21	926,918 75
Forestry Operations Division	4,874 06	2,263,944 67
Forest Products Laboratories	2,386 41	568,587 47
Grant to Canadian Forestry Association		6,000 00
Grant to Pulp and Paper Research Institute		100,000 00
Eastern Rockies Forest Conservation Board		810,804 93
	<hr/> 25,616 68	<hr/> 4,785,890 24
Canadian Government Travel Bureau	340 77	1,442,655 15
Totals for Department	<hr/> \$2,163,339 99	<hr/> \$19,118,141 28

* Expenditures include Exchequer Court Awards, \$160.65, and Gratuities to Families of Deceased Employees, \$3,780.80.

NORTHERN ADMINISTRATION AND LANDS BRANCH

The Northern Administration and Lands Branch is responsible for the administration of natural resources vested in the Crown in the right of Canada in the Northwest Territories and the Yukon Territory, the management of certain land and mineral rights vested in the Crown in the right of Canada in the provinces, and the administration of Eskimo affairs.

The Branch administers the Northwest Territories under the Northwest Territories Act R.S.C. 1952, as amended. There being no Territorial Civil Service, all administrative functions of the Government of the Northwest Territories are performed by the Branch. The Commissioner's report on the administration of the Territories appears on page 113.

The Branch is also responsible for the administration of the Yukon Territory under the Yukon Act R.S.C. 1952, as amended. The administrative functions of the Government of the Territory are performed by a Territorial Civil Service under the Commissioner of the Territory. The Commissioner's report on the administration of the Territory appears on page 118.

The Branch maintains offices at Ottawa, Edmonton, Fort Smith, Yellowknife, Hay River, Aklavik, Whitehorse, Mayo, and Dawson.

Administration of the Northwest Territories

The Northwest Territories Act provides for the administration of the Northwest Territories by a Commissioner (who is Deputy Minister of Northern Affairs and National Resources) under instructions given from time to time by the Governor in Council or the Minister of Northern Affairs and National Resources, and a Council of eight members which has legislative powers analogous to those of a Province. The membership of the Council consists of five senior Civil Servants appointed by the Governor in Council and three elected representatives from electoral districts in the District of Mackenzie. The last election was held in August, 1951, and the next will be held in 1954. At the close of the fiscal year the Commissioner was R. Gordon Robertson. The appointed members were F. J. G. Cunningham (Deputy Commissioner), L. C. Audette, W. I. Clements, L. H. Nicholson, and Jean Boucher. The elected members were James Brodie, Fort Smith (Mackenzie South) and Frank Carmichael, Aklavik (Mackenzie West). There was a vacancy for the constituency of Mackenzie North, the former member having resigned in July, 1953. The appointed officers of the Council are J. R. E. Bouchard, Secretary, and W. Nason, Legal Adviser. During the year, the Council held three sessions, one at Yellowknife from June 25 to 30 inclusive, and two at Ottawa from December 7 to 12 inclusive and on February 18.

The Public Services Section of the Territorial Division is responsible for the preparation of legislation to be submitted to the Northwest Territories Council for consideration; the preparation of regulations made under Ordinances; the administration of taxation and other revenue legislation; the disposition of certain grants to the Territories under acts of the Government of Canada; the administration of Ordinances relating to law enforcement, public health, and the care of the aged and indigent; and the preparation of the agenda for meetings of the Council and correspondence dealing generally with legislation. The Section is also responsible for liaison between the Government of the Yukon Territory and Federal Government departments.

Administration of Yukon Territory

The Yukon Act provides for the administration of the Yukon Territory by a Commissioner (who is an officer of the Branch) under instructions given from time to time by the Governor in Council or the Minister of Northern Affairs and National Resources, and a Council which has legislative powers analogous to those of a province. The Council consists of five members elected from electoral districts in the Territory. The last election was held in August 1952 and the next will be held in 1955. At the close of the fiscal year the Commissioner was W. G. Brown. The elected members and the district each represents were:

James Mellor, Dawson (Dawson District); Alexander Berry, Mayo (Mayo District); A. R. Hayes, Carmacks (Carmacks District); J. L. Phelps, Whitehorse (Whitehorse East); Frederick Locke, Whitehorse (Whitehorse West).

The appointed officers are Dale Robertson, Secretary, and F. G. Smith, Legal Adviser. During the year, the Council held three sessions at Whitehorse.

The move of the capital from Dawson to Whitehorse was completed in March, 1953 and the administration of the Yukon Territory has been carried out from Whitehorse for the whole of the fiscal year. The territorial administration offices are still in temporary quarters but it is expected that the new federal building now being constructed will be ready for occupancy in July or August, 1954.

Lands Division

Accelerated exploration for both minerals and oil in the Yukon Territory and the Northwest Territories has added considerably to the volume of the work of the Lands Division which is responsible for the administration of Crown-owned lands, mineral rights and timber in these areas. Mineral rights underlying certain lands in the provinces controlled by the Director of Soldier Settlement, in which there is no soldier interest remaining, have been transferred to this Department for administration and tenders are invited periodically for oil leases on these lands. This Division also administers all public lands under the control and administration of the Minister of Northern Affairs and National Resources dealt with under the Public Lands Grants Act, 1950. Included in these are former Ordnance and Admiralty Lands, lands which were reserved to Canada by the Natural Resources Agreements and various parcels which from time to time are placed under the Administration of Northern Affairs and National Resources by other departments of the Federal Government.

A Central Office of Record of federally-owned lands provides an ever-increasing service to other departments which have taken advantage of this opportunity to record with one central agency particulars regarding lands under their administration. A Central Registry maintains plans and documents relating to lands under the control of this Department. Seed grain, fodder and relief records are being reviewed in order that steps may be taken in conjunction with the provinces concerned to make recommendations in connection with adjustments or apportionments of the accounts representing advances made by the Federal Government to settlers in the western provinces.

The search for oil in Western Canada and the increasing value of underrights has created a steady demand by provincial governments and private interests for information contained in the former Dominion Lands records. Homestead entries and applications for Letters Patent continue to provide, in many cases, the only proof of age of applicants for Old Age Pension.

Mining

Northwest Territories

Although there was one less gold producing mine in the Yellowknife Mining District in 1953, there was a marked increase in the amount of bullion produced from the three operating mines. This abrupt rise can be attributed to an increase in daily tonnage and a higher grade of ore milled. Eight mines conducted underground development, including three gold properties, three uranium properties, one nickel mine, and one tantalum-columbium open pit operation. Preliminary development, consisting of diamond drilling, was carried out at eleven properties in scattered locations throughout the Northwest Territories. There were seven widespread areas of staking activity on uranium, copper, nickel and iron showings.

The total value of gold and silver produced in the Yellowknife Mining District totalled \$10,134,238 from an average of 1,264 tons of ore milled daily. The conversion from shrinkage stoping to cut and fill mining increased costs slightly but the better grade of ore recovered owing to less dilution encountered in the cut and fill method compensated for this.

Ore reserves were increased by deepening the shafts or winzes at the three producing gold mines, and considerable lateral work paved the way for increased stope development. Roasting and milling of the concentrates which were stockpiled at the mine that shut down the previous year were abandoned because it was found uneconomical to treat these concentrates after weathering had leached the stockpile. A new brick stack replaced the former steel one at one of the gold mines where arsenic is recovered from the roaster fumes to reduce the health hazard around Yellowknife. An average of 750 men were employed at the three gold mines.

At Great Bear Lake, ore reserves were increased by further deepening of a winze and increased lateral development. Leaching of old tailings increased production slightly. Exploratory diamond drilling revealed copper mineralization which touched off a minor staking rush to the area during the winter.

At Hottah Lake, 3,100 tons of radioactive material was produced at a mine employing an average of 18 men, but milling was discontinued during the summer in order to winterize the surface plant. A new uranium discovery was made in this area; several new claims were staked and a great deal of assessment work was performed.

No further underground development was conducted near Stark Lake but a new uranium-bearing ore body was located; exploratory work was conducted after a staking rush had developed. On the north shore of the east arm of Great Slave Lake, an open-pit tantalum-columbium operation milled approximately 7,000 pounds of concentrates which were shipped to Quebec for further refinement.

On the west shore of Hudson Bay, a nickel company shipped in a complete plant for shaft sinking. This consisted of 1,500 tons of freight, including compressors, mine hoist, electrical plant, head frame, buildings, and supplies. A shaft was sunk to a depth of 330 feet and lateral work commenced on two levels to outline the ore body.

Following a staking rush to the Marian River area during 1953, eight companies performed exploratory diamond drilling as well as geophysical and geological surveys to determine the potentialities of uranium mineralization.

Diamond drilling continued to improve ore reserves at Pine Point. The connecting road to the Mackenzie Highway was improved and experiments were conducted to determine the effects of ice on piers in the Buffalo River. Diamond drilling was done on a gold showing at Ennadai Lake, and five exploration companies were active in the Arctic and Hudson Bay Mining District exploring for copper and nickel. At the Belcher Islands, over 700 mineral claims were staked during the winter on potential iron deposits.

A new copper discovery was made in the winter at the east end of Great Slave Lake which precipitated a staking rush to that area. Late in the autumn of 1953 two new uranium areas were found, one at Tourangeau Lake and one at Trout Rock but weather conditions prevented the continuation of exploratory work.

Arthur Irwin, former resident geologist for the Department of Mines and Technical Surveys at Yellowknife was appointed Department of Northern Affairs and National Resources oil conservation engineer for the Northwest Territories and Yukon Territory with offices in Edmonton. Dr. J. McGlynn was appointed resident geologist to fill the vacancy created in Yellowknife. The resident mining inspector at Yellowknife continued to conduct underground safety inspections as well as mineral claim inspections. One of the mines at Yellowknife achieved a record of having the lowest accident frequency of all mines in the Prairie Provinces and the Northwest Territories. Courses in first aid and mine rescue training were continued at the Mine Rescue Station in Yellowknife and the superintendent made periodical visits to outlying mines to train personnel in this important work. Certificates were issued to 32 men who successfully completed the mine rescue courses in 1953.

Value of Mineral Production*
Northwest Territories

	1949	1950	1951	1952	1953†	Total to year ended Dec. 31, 1953
Gold	\$6,389,748	\$7,635,227	\$7,819,975	\$8,484,601	\$10,079,073	\$61,358,060
Silver	52,350	50,198	60,728	49,492	55,165	1,162,260
Lead .....	.....	.....	.....	4,443	.....	4,933
Copper .....	.....	.....	536	1,969	.....	26,607
Crude petroleum..	353,108	352,656	399,887	379,160	376,800	4,916,919
Natural gas	6,523	12,818	7,621	9,698	10,000	65,255
Tungsten .....	.....	.....	.....	15,472	.....	53,146
	\$6,801,729	\$8,050,899	\$8,288,747	\$8,944,835	\$10,521,038	\$67,587,180

* Exclusive of production of radioactive minerals.

† Preliminary figures.

Revenue

Total revenue received from mining in the Northwest Territories was \$83,969.67, made up as follows: coal permits, \$15.00; coal royalty, \$23.21; miner's licences \$25,186.95; quartz mining surface leases, \$1,568.64; quartz mining fees, \$35,540.65; quartz mining leases, \$4,084.30; quartz mining royalty, \$16,235.61; sale of claim sheets, \$387.75; sale of maps, \$798.67; quarrying leases, \$23.34; gravel permits, \$101.55; and placer mining fees, \$4.

Yukon Territory

The depressed markets for lead and zinc in 1953 led to a swing of the exploration trend from the Mayo Mining District to the Whitehorse Mining District. Since the discovery of a copper-nickel deposit in 1952 in the Kluane Lake area, exploration activities have revealed considerably more geological information and many new mineral showings were staked along the Shakwak Valley. A discovery of lead-zinc mineralization with minor amounts of copper was made in August, 1953 in the Glenlyon Mountains area near Vangorda Creek, and resulted in a major staking rush. During the winter, a copper discovery was made in the Carmacks area which caused a minor rush. Inclement weather conditions prohibited large scale mineral investigations.

Dawson Mining District

Two placer gold mining companies operated dredges in this district in 1953, one operating six dredges and the other one dredge. There were seven hydraulic and eleven bulldozer and sluice-box operations recovering placer gold. Stripping operations preliminary to future placer activities were conducted in five different areas.

There were 38 placer grants issued and 1,358 placer claims maintained in good standing. There was little activity in quartz mining although some interest was shown on the silver-lead-tungsten showings on Casino Creek as well as the asbestos occurrences east of Dawson. Twenty-six copper claims on Gold Bottom Creek were kept in good standing and some interest was shown on reported fluorite deposits in the Sixty-Mile River area.

Mayo Mining District

Notwithstanding the lower prices for lead and zinc, the main producing company in this district achieved its best production record since commencing operations in 1946. The average monthly production of silver was 500,000 ounces. Ore reserves were increased by deepening a winze, and stope development assured a continued increase in production. Construction and exploration activities of this company were kept to a minimum.

A new concentrator near Keno City commenced operations in April, 1953, treating approximately 100 tons of ore per day. The silver-lead-zinc ore is trucked to the mill from two different mines. Some difficulty was experienced in the early stages of operations, as the oxidized nature of the ore was not responsive to flotation. At one of these mines, an inclined winze has opened two new levels of good ore and at the other mine all production is from stope development on the adit levels. Four other mines carried on underground development early in the year, one company operating on two separate properties; these mines were forced to cease operations later in the year.

Two placer gold properties were worked with encouraging results. Only 62 new quartz claims were staked which indicates the decreased interest shown in exploration activities for lead and zinc. There were 1,626 quartz claims, 166 quartz leases, and 78 placer claims maintained in good standing in this district.

Whitehorse Mining District

The discovery of a copper-nickel deposit near Quill Creek in the Shakhwak Valley in 1952 precipitated a claim staking rush of major proportions. As a result of this increased activity, many new showings of copper and nickel were discovered in 1953 all along the Shakhwak Fault. Geophysical exploration, utilizing airborne magnetometers and electrical resistivity surveys on the ground, revealed additional favourable anomalies that will bear further investigation by diamond drilling programs.

In August, 1953, a claim staking rush developed in the Vangorda Creek area about 30 miles west of Ross River trading post on the Pelly River. Several major mining companies staked mineral claims on what appears to be a large replacement deposit of lead and zinc, with minor values of copper and gold. Diamond drilling confirmed the presence of a potentially large replacement deposit similar in character to the deposits on the south shore of Great Slave Lake, but with additional values in other metals. During the winter, a copper discovery in the Carmacks area started a minor staking rush.

Improvements in mining methods and machinery at the only active coal mine in the Yukon Territory resulted in a more efficient and productive operation. Coal from this mine, which is near Carmacks, is now being used exclusively for heating at all properties of the parent companies.

There were only two other active underground operations in this district during the year. However, one of these encountered a metallurgical problem in separating tungsten from lead. Owing to the decreased market for both of these products, the mine ceased to operate. A total of 3,989 mineral claims was recorded in the office of

the mining recorder at Whitehorse and 1,284 certificates of work were issued. With the appointment of a resident mining inspector in March, 1953, regular safety inspections of all underground mining operations were made as well as several mineral claim inspections.

Preliminary figures show that the following amounts of minerals were produced in the Yukon in 1953: gold, 69,663 ounces; silver, 6,244,919 ounces; lead, 28,761,326 lbs.; zinc, 19,500,000 lbs.; and cadmium, 266,000 lbs.

Revenue

Total revenue received from mining in the Yukon was \$172,226.34 made up as follows: coal leases, \$597.92; quartz mining leases, \$6,295; quartz mining fees, \$68,342.58; quartz mining royalty, \$24,594.76; placer mining fees, \$38,793; placer gold royalty, \$31,200.08; hydraulic leases, \$2,390 and sale of claim sheets, \$13.

Value of Mineral Production Yukon Territory

	1949	1950	1951	1952	1953*	Total to year ended Dec. 31, 1953
Gold	\$2,950,920	\$3,551,549	\$2,856,022	\$ 2,690,846	\$ 2,398,497	\$235,053,503
Silver	1,160,327	2,588,486	3,255,156	3,364,646	5,247,605	38,194,119
Lead	846,312	1,861,957	2,306,085	2,973,883	3,789,305	17,153,946
Copper						2,711,695
Coal	29,382	40,960	60,597	139,345	63,000	1,162,333
Tungsten			7,098			25,413
Zinc	112,235	861,873	1,130,121	1,932,853	2,332,200	6,369,282
Antimony						173
Cadmium		130,871	178,091	284,878	532,000	1,180,430
Total	\$5,099,176	\$9,035,696	\$9,793,170	\$11,386,451	\$14,362,607	\$301,850,894

* Preliminary figures.

Oil and Gas—N.W.T. and Yukon

On May 1, 1953, new regulations respecting the administration and leasing of oil and gas rights in the Northwest Territories and Yukon Territory became effective.

During the 1953-54 season, sixty-three exploratory permits comprising an area of 3,425,016 acres were granted; fifty-two assignments comprising 137 permits were registered.

Following is a summary of oil and gas permits, leases, and reservations in good standing in the Northwest Territories and Yukon Territory on March 31, 1954: 396 permits involving 23,166,660 acres in the Northwest Territories and 67 permits involving 3,761,666 acres in Yukon Territory; two reservations involving 4,792 square miles each in the Yukon and Northwest Territories; nine leases involving 6,158 acres in the Northwest Territories; and two surface leases involving 892.2 acres in the Northwest Territories.

During the winter of 1953-54, five seismic parties were active in the Northwest Territories. Nine new wells were drilled and abandoned, and one which had been suspended in 1952 was deepened and then abandoned, making a total depth of 17,135 feet drilled last year.

A total of \$103,696.03 was received from oil and gas in the Northwest Territories. This was made up as follows: oil and gas leases, \$3,354.23; permit fees, \$9,250.00; assignment fees, \$5,100.00; forfeitures, \$39,652.97; exploratory licences, \$425.00; royalties, \$8,888.95; and Government's share of production, \$37,024.88. In Yukon Territory \$6,000 was received from permit fees and \$100 from exploratory licences.

Mineral Rights in the Provinces

Seven public competitions were held for the purchase of leases of the petroleum and natural gas rights underlying 108 parcels of land in Alberta, Saskatchewan, and Manitoba. Leases were granted for the rights in 87 parcels. The mineral rights in 262 properties, covering 41,900 acres, were released to the administration of this Department by the Department of Veterans Affairs. Two wells were completed as producing wells in Manitoba during the fiscal year.

Total revenue from mineral rights in the provinces amounted to \$213,646.95, made up as follows: bonuses for the purchase of petroleum and natural gas leases, \$160,907.94; rentals, \$34,479.05; lease fees, \$435.00; assignment fees, \$18.00; extension fees, \$17,119.02; sales in Ontario, \$250.00; and royalties on production, \$437.94.

Lands, Timber and Grazing

Northwest Territories (including Wood Buffalo National Park)

There has been an increase of approximately 25 per cent in the volume of both lands and timber transactions over the previous fiscal year with a proportionate rise in the total revenue. The number of land sales decreased slightly by comparison with 1952-53 but this was offset by a rise in the number of leases and agreements of sale.

Land Sales

There were 118 land sales completed in the Northwest Territories in the fiscal year. In addition, five new agreements of sale are in effect, four of which are for the benefit of veterans receiving assistance under the Veterans' Land Act. The total number of agreements of sale in force is 39, of which 31 are issued to veterans.

Land Privileges

The 204 land privileges in force include: agricultural lease, 9; docksite lease, 1; fur farm lease, 5; grazing lease, 4; licence of occupation, 7; permission to occupy, 48; shipyard lease, 1; surface lease, 98; and waterfront lease, 31.

Twenty-four of the surface leases were for the benefit of qualified veterans.

Timber

One hundred and thirty-one general permits and 12 commercial permits were issued.

<i>Timber Cut</i>	<i>Lumber (Ft. B.M.)</i>	<i>Round Timber (Lin. ft)</i>	<i>Fuel Wood (Cords)</i>
General permits	280,000	28,630	5,315½
Commercial permits	7,535,740	429,917	1,461
Total cut	7,815,740	458,547	6,776½

Hay Permits and Grazing Leases

Two hay permits were issued authorizing the cut of 15 tons.

There were four grazing leases in force during the fiscal year. Stock returns submitted indicated six horses and 11 head of cattle maintained on the leaseholds.

Revenue

Total revenue amounted to \$100,807.21, made up as follows: timber, \$56,077.81; lands, \$40,207.33; hay and grazing, \$1; miscellaneous, \$4,356.92; and land titles office, \$164.15.

Yukon Territory

In the past fiscal year there has been a consistent general increase in land transactions. The number of agreements of sale increased by approximately 30 per cent. A slight decrease has been noted in the quantity of timber cut. However, the total revenue from timber and lands remains constant.

Land Sales

There were 40 land sales completed in the Yukon Territory during the fiscal year. In addition, there were 48 new agreements of sale in force, 14 of which were arranged for veterans receiving assistance under the Veterans' Land Act. The total number of agreements of sale in force is 128, of which 100 are issued to veterans.

Land Privileges

There were 143 land privileges in force including: agricultural lease, 6; fur farm lease, 1; grazing lease, 8; licence of occupation, 3; permission to occupy, 38; surface lease, 65; and waterfront lease, 22.

Timber

Two hundred and thirty-one general permits and 37 commercial permits were issued.

<i>Timber Cut</i>	<i>Lumber (Ft. B.M.)</i>	<i>Round Timber (Lin. ft)</i>	<i>Fuel Wood (Cords)</i>
General permits .....	.....	189,364	7,611
Commercial permits	4,116,910	2,202,345	789½
Total cut	4,116,910	2,391,709	8,400½

Hay Permits and Grazing Leases

Three hay permits were issued authorizing a cut of 32 tons. There were eight grazing leases in force during the fiscal year. Stock returns submitted indicated 71 horses were maintained on the lease-holds.

Revenue

Total revenue amounted to \$62,306.57, made up as follows: timber, \$39,554.04; lands, \$19,532.51; hay and grazing, \$12.75; miscellaneous, \$2,070.87; and land titles office, \$1,136.40.

Public Lands in the Provinces

Every effort is made to make these lands revenue producing and, when there is no further requirement for public purposes, appraisals are made and the land is offered for sale. Research continues, particularly in connection with the former Ordnance and Admiralty lands records as title must be determined before disposal can be considered.

One additional parcel of land was transferred to this Department by another department of Government and 25 parcels were acquired by exchange. Twenty-seven parcels were made available for other Federal departments and three were transferred to provincial control.

By outright sale, nine subdivision lots and 13 parcels were disposed of; eight of these being sold for nominal sums for public purposes. Letters Patent were issued for nine lots and nine parcels. Agreements of Sale were prepared for five lots and three parcels. At the present time, there are 138 active leases, licences of occupation, or permits covering 85 lots and 66 parcels of land.

Total revenue was \$79,490.17 received during the fiscal year: sales, \$40,563.00; agreements of sale (instalments), \$30,746.54; rents, \$8,099.63; and fees, \$81.00.

Central Office of Records

There were 1,226 new abstracts of title integrated into the Central Office of Records of Federal Lands during the fiscal year. At the present time the Lands Division has basic information on nearly 20,000 parcels of land throughout Canada under the administration of the Federal Government.

Dominion Lands Records

Former records pertaining to Dominion lands in the western provinces, of which the Federal Government was made the custodian under the National Resources Agreement, are the subject of steadily increasing inquiries from the provincial governments and other interested parties. With the finding of oil and the search for strategic minerals, the values of the underrights have pyramided; the information most urgently sought concerns what rights were conveyed by the Crown in the original grant.

The examination and segregation of old Dominion Lands files continued and over 100,000 were dealt with. Permission has been requested from the Public Records Committee for the destruction, after examination, of certain material contained on Mining Lands files dealing with Federal lands in Manitoba, Saskatchewan, Alberta, the Railway Belt and Peace River Block in British Columbia, Yukon Territory, and the Northwest Territories, prior to 1930.

There were 453 certified copies of Letters Patent prepared at the request of provincial governments and private individuals for which \$620 was received.

Seed Grain, Fodder and Relief Indebtedness

The indebtedness referred to under this section represents those accounts still outstanding for advances of seed grain, fodder for animals and other relief made by the Federal Government to homesteaders and early settlers in Western Canada from 1876 to 1926.

During the fiscal year, the Seed Grain Adjustment Boards made recommendations on 1,170 accounts; on 390 of these payments were received, the balance being written off. In addition to the accounts previously referred to, 10 were paid in full. As a result \$466,768.27 of principal and interest was written off and \$62,917.26 was received in payments. A total of 4,193 liens were discharged. There were 2,500 Federal and approximately 3,600 Joint Federal-Provincial accounts still outstanding.

The following summary shows the financial operation for the year:

SUMMARY

	<i>Principal</i>	<i>Interest</i>	<i>Total</i>
<i>Debits</i>			
Amount outstanding			
March 31, 1953	\$1,160,734 34	\$2,111,151 41	\$3,271,885 75
Accrued interest April 1, 1953, to March 31, 1954		66,336 59	66,336 59
Total Debits	\$1,160,734 34	\$2,177,488 00	\$3,338,222 34
<i>Credits</i>			
Net Revenue April 1, 1953, to March 31, 1954	\$ 50,020 27	\$ 12,896 99	\$ 62,917 26
Amounts written off as loss by Orders in Council April 1, 1953, to March 31, 1954	128,215 23	338,553 04	466,768 27
Total Credits	\$ 178,235 50	\$ 351,450 03	\$ 529,685 53
Amounts outstanding			
March 31, 1954	\$ 982,498 84	\$1,826,037 97	\$2,808,536 81

MANITOBA

	<i>Principal</i>	<i>Interest</i>	<i>Total</i>
<i>Debits</i>			
Amount outstanding			
March 31, 1953	\$ 2,587 90	\$ 4,494 97	\$ 7,082 87
Accrued interest April 1, 1953, to March 31, 1954 .....	.....	70 81	70 81
Total Debits	\$ 2,587 90	\$ 4,565 78	\$ 7,153 68
<i>Credits</i>			
Net Revenue April 1, 1953 to March 31, 1954	\$ 361 15	\$ 318 13	\$ 679 28
Amounts written off as loss by Orders in Council April 1, 1953 to March 31, 1954	1,067 23	2,321 40	3,388 63
Total Credits	\$ 1,428 38	\$ 2,639 53	\$ 4,067 91
Amount outstanding March 31, 1954	\$ 1,159 52	\$ 1,926 25	\$ 3,085 77

SASKATCHEWAN

	<i>Principal</i>	<i>Interest</i>	<i>Total</i>
<i>Debits</i>			
Amount outstanding			
March 31, 1953	\$ 918,050 23	\$1,677,520 72	\$2,595,570 95
Accrued interest April 1, 1953 to March 31, 1954 .....	.....	54,447 85	54,447 85
Total Debits	\$ 918,050 23	\$1,731,968 57	\$2,650,018 80
<i>Credits</i>			
Net Revenue April 1, 1953, to March 31, 1954	\$ 39,926 40	\$ 7,492 51	\$ 47,418 91
Amounts written off as loss by Orders in Council April 1, 1953, to March 31, 1954	80,645 56	225,980 38	306,625 94
Total Credits	\$ 120,571 96	\$ 233,472 89	\$ 354,044 85
Amount outstanding March 31, 1954	\$ 797,478 27	\$1,498,495 68	\$2,295,973 95

ALBERTA

	<i>Principal</i>	<i>Interest</i>	<i>Total</i>
<i>Debits</i>			
Amount outstanding			
March 31, 1953	\$ 240,096 21	\$ 429,135 72	\$ 669,231 93
Accrued Interest April 1, 1953 to March 31, 1954 .....	.....	11,817 93	11,817 93
Total Debits	\$ 240,096 21	\$ 440,953 65	\$ 681,049 86
<i>Credits</i>			
Net Revenue April 1, 1953, to March 31, 1954	\$ 9,732 72	\$ 5,086 35	\$ 14,819 07
Amount written off as a loss by Orders in Council	46,502 44	110,251 26	156,753 70
Total Credits	\$ 56,235 16	\$ 115,337 61	\$ 171,572 77
Amount outstanding March 31, 1954	\$ 183,861 05	\$ 325,616 04	\$ 509,477 09

Lands Division Revenue

The total of revenue received by the Lands Division from all sources is summarized as follows:

	<i>N.W.T.</i>	<i>Yukon</i>	<i>Provinces</i>	<i>Total</i>
Mining	\$187,665 70	\$178,126 08	\$213,646 95	\$579,438 73
Lands, Timber and Grazing	100,807 21	62,306 57	143,027 43	306,141 21
	\$288,472 91	\$240,432 65	\$356,674 38	\$885,579 94

Territorial Division

Development Services

Development Services is responsible for the administration of matters pertaining to construction and maintenance of roads and departmental buildings; settlement improvements, including electrical services; transportation; sanitation, including water and sewer services; and general engineering programs.

Buildings

The Department of Public Works completed the conversion of one large building at Fort Smith into seven small apartments and four offices for the use of employees of the Department. Under the supervision of departmental engineers a residence, small office, and small warehouse were constructed at Fort Simpson and rooms were added for teachers' quarters to the departmental school building at Tuktoyaktuk. Construction by contract was begun on an eight-classroom day school and apartment building at Aklavik for which the Department of Public Works placed foundation piles. When the decision was made to move the settlement all construction on these buildings was stopped. A garage-workshop-laboratory building and a residence were built in Aklavik. Alterations and repairs were made to several of the department's buildings at Fort Smith and at other settlements in the Mackenzie District. In Wood Buffalo National Park, Mackenzie District, several small overnight patrol cabins were constructed by the warden staff. At the Reindeer Station, a workshop was constructed by departmental employees.

At Upper Whitehorse, Yukon, three double garages were built by contract for use by employees occupying departmental houses. A start was made on landscaping the ground around these buildings. A concrete basement was placed under one of the Department's double houses at Lower Whitehorse.

Municipal Facilities

The river ice at Hay River Settlement was blasted prior to the spring breakup to alleviate the danger from spring flooding. This has been an annual operation for several years.

The operation of the Fort Smith all-year water system and the Aklavik summer water system previously supervised by this Department became the responsibility of the Territorial Government on March 31, 1953.

Roads

The following trunk roads in the Northwest Territories were maintained by arrangement: the Northwest Territories section of the Mackenzie Highway, the Alberta-Fort Smith-Bell Rock road, the Yellowknife-Airport Highway, the Negus-Giant-Akaiicho road, and the two roads to airports at Fort Simpson and Fort Providence. The roads and trails of Wood Buffalo National Park were maintained by departmental employees.

The Department provided \$2,500 as 50 per cent of the cost of the construction of a winter truck road from Rocher River to O'Connor Lake, Great Slave Lake area, to assist mining companies developing properties in the vicinity. A by-pass road around the southern side of Fort Smith was constructed by the Department at a cost of \$3,000 in order to improve and shorten the trucking route from Fitzgerald to Bell Rock.

The Territorial Government assumed responsibility for the maintenance of roads in settlements in the Northwest Territories other than municipal districts. They also provided grants towards the construction of roads in Yellowknife and Hay River Municipal Districts. The Council of the Municipal District of Yellowknife assumed responsibility for the upkeep of sections of the trunk roads which lie within the surveyed portion of the settlement on March 31, 1953.

The 246-mile Whitehorse-Mayo all-weather highway in the Yukon was maintained by the Territorial Government, the Federal Government contributing one-half of the cost. The 26-mile part of the Atlin Road lying within the Yukon Territory was maintained by the Territorial Government with funds provided by the Federal Government. Construction was continued on the 110-mile all-weather road from Dawson to its junction with the Whitehorse-Mayo Highway near Stewart River Crossing. This is a three-year project with an estimated total cost of \$500,000 of which amount \$300,000 will be provided through this Department. The new 10-mile resource road between Keno and the top of Keno Hill was completed. The Federal Government provided 50 per cent of the cost of constructing this road.

The maintenance of the Alaska Highway, of access roads to airports along the Northwest Staging Route and of flight strips bordering the Highway was under the jurisdiction of the Northwest Highway System (Canadian Army). The Highway was open for traffic throughout the year. Similar maintenance was carried out on the Haines Road which was open to traffic during the summer months only.

Facilities for tourist accommodation and for the maintenance and repair of motor vehicles continued to increase in number. The Department, with the help of the Northwest Highway System, maintained 10 public overnight camp-grounds and five lunch stops.

Regular bus services were operated on the Highway between Dawson Creek, British Columbia, and Dry Creek, Yukon Territory, by the British Yukon Navigation Company.

Conservation and Management Services

Conservation and Management Services are responsible for conservation of the forest and timber resources of the Northwest Territories and Yukon Territory (with the exception of the sale of timber berths); the maintenance of an adequate fire protection and supervision service for the forests, including administration and enforcement of the Forest Fire Protection Ordinances; the management of Wood Buffalo National Park, the Buffalo Project; and the Reindeer Project. The service is responsible for wildlife management in the Northwest Territories. On behalf of the Territorial Government, it administers and enforces the Game Ordinance, the Fur Export Ordinance, and is responsible for fire protection in the settlements.

Warden Service in the Northwest Territories

The Warden Service is responsible for the detailed field administration of game and forest resources, including forest fire protection and all other conservation and management activities. While the Warden Service is maintained by the Federal Government, it administers wildlife resources for the Territorial Government.

These activities are carried out in the Mackenzie District by two Chief Wardens, located at Fort Smith and Fort Simpson, and eleven wardens, located at Aklavik, Fort McPherson, Fort Good Hope, Fort Norman, Fort Simpson, Fort Liard, Hay

River, Fort Resolution, Rae, Yellowknife and Fort Smith. A patrolman is employed at each warden establishment to assist the warden. In addition, a patrolman is stationed at Fort Providence.

Additions were made to the fire suppression and patrolling equipment at the warden stations and minor improvements and additions were also made to a number of wardens' residences, warehouses, and offices. Additional patrol cabins were built to facilitate long patrols. Three of the larger boats were equipped with radio-telephones to facilitate rerouting and communication of instructions during the fire hazard season.

Availability of charter aircraft at Fort Smith and Yellowknife permits the protection of the area within a 125-mile radius of these points. Small standby suppression crews were stationed at Fort Smith and Yellowknife during the 1953 fire season. When not engaged in fire suppression or the repair and maintenance of fire equipment, these men were available for other work as required.

A well-equipped repair depot for fire pumps, outboard motors, and other fire-fighting equipment was maintained at Fort Smith. All repairs on equipment used locally were made there, in addition to major repairs on all equipment used throughout the District.

Fire prevention warnings were printed in newspapers and broadcast by radio. Forest fire prevention signs were placed or maintained in prominent locations along roads and trails, at the beginning and end of portages, and in camping grounds along the common routes of travel. Lectures on fire prevention and suppression were delivered in schools and at trappers' meetings. Instruction on fire prevention was part of the natural science and social studies in the schools. Literature on these subjects was given wide circulation.

The Canadian Wildlife Service provided technical and scientific advice on game resources and maintained a staff of five field mammalogists in the Northwest Territories. Mammalogists were located at Fort Smith, Yellowknife, Fort Simpson, Aklavik, and Churchill.

With assistance from the Canadian Wildlife Service, a beaver transplant was made in the Mackenzie Delta Beaver Sanctuary; experiments in the improvement of muskrat habitat by means of small dams were carried out in the Mackenzie Delta, and a survey of beaver habitat in the Fort Rae warden district was made to determine areas suitable for a beaver transplant.

Forest Protection and Management—

Northwest Territories and Wood Buffalo National Park

The 1953 fire season in the Northwest Territories and Wood Buffalo Park was characterized by drought, heat and high winds and was, therefore, one of the most difficult years for forest fire suppression.

Comparable forest fire figures for the 1953 and 1952 seasons are shown on the following table:

	1953	1952
Number of fires	65	41
Area burned (acres)	2,152,175	137,124
Amount of merchantable timber burned:		
Saw timber (ft. b.m.)	84,900	35,000
Other material (cords)	314,400	1,410

Cost of suppression of four of the fires in the Fort Smith—Wood Buffalo National Park forest fire control area ranged from \$6,500 to \$20,000, with the largest fire covering an area of approximately 550,000 acres. The Province of Alberta joined in fighting a fire which for a time threatened Fort Fitzgerald, Alberta and Fort Smith, N.W.T.

In the same area, fires caused considerable damage to a number of registered trapping areas. Loss of forest cover in the affected areas ranged from an estimated 15 per cent minimum to a 90 per cent maximum. There will be a drastic drop in the fur potential in these areas for many years to come.

While the amount of merchantable timber burned was not great, portions of the burnt-over areas were probably potentially productive. The destruction of trapping areas and the caribou range by forest fires are additional incalculable losses.

There were 25 fires attributable to lightning in 1953 as compared to five in 1952. Camp-fires were the principal known cause of the 1953 fires; 28 fires resulted from camp-fires in 1953 as compared to 18 in 1952. Two convictions were obtained for violations of the Forest Protection Ordinance, both of which were concerned with failure to properly control and extinguish camp-fires.

During the year, surveys were made with a view to establishing a long-term policy on forest fire control and forest conservation. One result has been the establishment of standards for forest fire suppression equipment at the various warden stations, and the Administration has embarked upon a program of bringing the equipment at these stations up to the standard.

Forest Protection and Management—Yukon Territory

The forest resources of Yukon Territory are a Federal responsibility. The Commissioner of Yukon Territory is responsible for field administration, assisted by a forest engineer at Whitehorse. The forest engineer directs the activities of five wardens, located at Whitehorse, Dawson, Teslin, Kluane Lake, and Mayo.

During the fire hazard season, seasonal wardens were employed at Watson Lake, Whitehorse, Mayo, and Carmacks. Seasonal labourers, including qualified fire bosses, were also employed. Within Yukon Territory, 40,000 square miles were under protection from forest fires by the Yukon Forestry Organization.

An increase of 21 forest fires in 1953 and a correspondingly large increase in the area burned was recorded. Merchantable timber losses were less. The comparable figures for 1953 and 1952 follow:

	1953	1952
Number of fires reported	44	23
Total area burned (acres)	77,557	31,631
Total merchantable timber burned (acres)	2,643	4,639

Of the 44 fires in 1953, 20 were in the 40,000 square miles under protection and 24 in the area normally considered as inaccessible. Light snow fell during the winter of 1952-53 and there was little rain prior to June 20. A very dry period in the latter part of the summer followed, contributing to a season of high fire hazard.

As far as can be determined, forest fires were caused by the following: 16 by camp-fires, 12 by smokers, three by settlers, one by railway, four by lightning, one by public works, one by an aircraft crash, three by other known causes, and three by unknown causes. Three prosecutions were made and two convictions were obtained for violations of the Forest Protection Ordinance, both of which were concerned with failure to properly control and extinguish camp-fires.

In an attempt to eliminate the fire hazard created by travellers' camp-fires, ten camp-grounds and six lunch stops, established at regular intervals along that part of the Alaska Highway in the Yukon Territory, are maintained by the Warden Service. These facilities were used by hundreds of travellers.

The fire prevention campaign was continued. Periodic visits to all industrial operations were made by the warden staff. Patrols were carried out by truck, boat, aircraft, and on foot to warn residents, tourists, campers, and woods workers. Fire

prevention signs were erected and maintained along the Alaska Highway and secondary roads. Signs were also posted along trails, at service stations, camp-grounds, lunch stops, and in other places where they would attract the attention of the travelling public. Conservation films, obtained from the National Film Board, were shown at all settlements and most of the camps and repeater stations along the Alaska Highway. Literature was distributed to schools and to the general public.

The Department of National Defence and all privately owned land, air, and water transportation companies were requested to report any fires observed. The general public was kept aware of the danger from fire by repeated warnings in the local newspaper and, during periods of high fire hazard, by announcements over the local radio station.

Reindeer Project

The Reindeer Grazing Reserve, comprising 17,900 square miles, extends from the Mackenzie River delta eastward along the Arctic Coast to Liverpool Bay and encompasses the Eskimo Lakes. There are five herds on the Reserve. Four of these, known as native herds, are managed by Eskimos under the supervision of the superintendent of the Reindeer Range Station and his staff. The fifth herd, known as the main herd, is operated by the Government and serves as a means of training young Eskimos in proper herding practices. It also serves as a nucleus from which new herds can be established under the management of qualified Eskimo herders.

At the annual roundups held in July and August 1953, the total number of reindeer reported was 7,731. The number in each herd was as follows: main herd, 2,685; native herd No. 1, 1,841; native herd No. 2, 2,039; and native herd No. 3, 1,166. In March, 1954, the fourth native herd was established by the separation of 1,200 reindeer from the main herd.

The total number of reindeer slaughtered for meat during the fiscal year was 893, the bulk of these being sold to the Hudson's Bay Company and Missions at Aklavik under a marketing plan sponsored by the Department. Five hundred and fifty skins were shipped for distribution to Eskimos in the Eastern Arctic.

A walk-in refrigerator, completed in Aklavik in September, 1953, was used as a central storage depot for the reindeer meat. Three portable freezers were reconditioned and made available for the storage of meat at secondary points in the Aklavik region.

The revenue from the sale of reindeer products for the fiscal year 1953-54 amounted to \$9,750 for the Department and \$18,900 for the managers of the native herds.

Education and Welfare Services

The Education and Welfare Services Section is responsible for matters relating to the organization of an educational program for the Northwest Territories, the inspection of all schools in the Territories, and the development of community welfare. While the education of white children and children of mixed blood is the responsibility of the Territorial Government, the necessary administrative services, subject to the requirements of the School Ordinance and the regulations thereunder are provided by this section. The education of the Eskimo population of the Northwest Territories and of the coastal region of northern Quebec is also the responsibility of the Education and Welfare Services.

The Department operated day schools at Aklavik, Fort Smith, Hay River, Fort Resolution, and Fort Simpson. Welfare teachers on the staffs of these schools gave leadership to local community activities.

In the field of Eskimo education, which includes the Arctic Coast, Arctic Islands and northern Quebec, the Department operated day schools at Tuktoyaktuk, Coppermine, Coral Harbour, Chesterfield Inlet, Fort Chimo, and Port Harrison. Arrangements were continued for the maintenance and education of Eskimo children in the Church of England and Roman Catholic Residential Schools at Aklavik, Northwest Territories, and Fort George, Quebec, and at Moose Factory, Ontario. In the principal settlements of Eskimo territory, day schools were operated by missions of the Church of England and the Roman Catholic Church. A day school was also conducted by the Canadian Interior Mission at Maguse River. The mission day schools in operation during the year received assistance from the Federal Government in the form of grants and school supplies.

The Department provided two teachers for Eskimo patients in the Parc Savard Hospital at Quebec City and also two teachers for Eskimo patients in the Charles Camsell Indian Hospital at Edmonton, Alberta. Arrangements were made to provide a teacher for Eskimo patients in Moose Factory Indian Hospital.

The curriculum prescribed by the Alberta Department of education is followed in the schools of the Mackenzie District. In order to maintain instructional standards, the schools of the district are inspected periodically by a Superintendent of Schools who has his headquarters at Fort Smith. Northern Administration has under consideration a special curriculum for use in Eskimo schools. Inspection services for these schools in the Eastern and Central Arctic and northern Quebec are being provided from Ottawa.

Arctic Division

The Arctic Division is responsible for the administration of the Canadian Arctic and of Eskimo affairs, excepting education and health; making patrols and inspections of centres of population in the Arctic; studying the Eskimo economy and rehabilitation problems; administering family allowances, old age assistance, and security and blind pensions to Eskimos; and maintaining the vital statistics records for the Northwest Territories and various records of Eskimos in Canada.

Economic Conditions

The white fox catch, on which the majority of the Eskimos depend for a large part of their income, was relatively small in the Western Arctic and Baffin Island during the past season. The catch on Banks Island, however, compared favourably with previous years, and, in most areas of northern Quebec and Keewatin, the cycle appeared to have reached its peak. There has been a somewhat better market demand for white fox during the past year, but prices have not yet risen to any appreciable extent. The income of most Eskimo communities, therefore, remains at a comparatively low level.

A revolving fund of \$50,000, to be known as the Eskimo Loan Fund, was set up in 1953-54. The purpose of the fund is to make loans to Eskimos for the purchase of supplies and equipment for approved projects which cannot be financed immediately by themselves or through other channels.

Among the projects undertaken under the Loan Fund during the past year were the outfitting of eleven families transferred from Port Harrison and Pond Inlet to Cornwallis and Ellesmere Islands, and the provision of supplies for the isolated community in the Herschel Island area. Other individuals have also been assisted to obtain sufficient supplies to enable them to continue trapping on Banks Island. All these groups are located in areas where there are no regular trading facilities and all have been successful in their operations during the past year.

Ways to widen and diversify the Eskimo economy were given continuing consideration. There has been a steady increase in volume and demand for Eskimo handicrafts and an appreciable income is now being derived from this source. This and other special projects have been placed under the direction of an experienced officer, with a view to further widening and diversifying their scope and usefulness.

Assistance was given to a boat-building project at Lake Harbour where a number of Eskimos received training in making scale models and in building boats. They made excellent progress and five whale boats were completed during the season. These have been disposed of to other Eskimo groups and the project will be continued in 1954 when further training will be given in building other types of boats required in the Eastern Arctic.

A similar project was also started in Tuktoyaktuk, in the Western Arctic, where a number of boats suitable for that area were built during the past year. This also will be a continuing operation designed to provide employment and to supply the boat requirements of Western Arctic settlements.

Seven Eskimos, two from Keewatin and five from Fort Chimo, were employed on the civilian maintenance staff by the military base at Fort Churchill. These men quickly adapted themselves to their new environment and their services have been so satisfactory that arrangements have been made to transfer ten more men from Fort Chimo this spring.

Building and other construction projects have also provided employment for a number of Eskimos at various places throughout the Arctic. Twenty men are employed permanently at the Frobisher Bay air base and most of the others in this area find employment during the summer months. Prospecting and mining activities continue to provide opportunities for employment in the Ungava Bay area and on the west side of Hudson Bay.

Natives who have moved out of overpopulated areas in previous years to regions where hunting and trapping conditions were more favourable have continued to prosper. The people on Banks Island particularly have been very successful since they went there three years ago.

Definite plans are now under way to educate and give technical training to Eskimos interested in and capable of taking advantage of increasing opportunities for employment in the Arctic and elsewhere. A roster is being prepared of all male Eskimos between 10 years and 30 years of age and this will be used as a basis for setting up educational and training programs and for selecting employable Eskimos.

Plans are also being made for extensive long-range research programs to evaluate the wildlife resources of the Arctic territories and the extent to which they can be safely utilized for the benefit of the steadily increasing population that must now be looked for. Other studies will also be started during the coming summer to determine where and to what extent domesticated or semi-domesticated animals may be introduced to provide food and revenues for the Eskimo population. Surveys are also being undertaken to determine where eider-duck concentrations are large enough to warrant development of eider-duck farming and down collecting as practised in Iceland.

A simple process for tanning hides has now been developed which will assist greatly in the local processing of skins for handicraft work and making clothing.

While progress in dealing with a primitive people must necessarily be slow, the steps that are now being taken to diversify the economy and to provide education and technical training will in time provide those who must remain as hunters and trappers with a higher standard of living and those others, who are so inclined, with opportunities for taking up other forms of gainful employment.

Patrols and Inspections

The annual Eastern Arctic Patrol was carried out again in the summer of 1953, utilizing the C.G.S. *C. D. Howe* and the C.G.S. *d'Iberville*. A new Royal Canadian Mounted Police detachment was established at Alexandra Fiord on the east coast of Ellesmere Island.

The personnel of this patrol included representatives of the Departments of Northern Affairs and National Resources, National Health and Welfare, Mines and Technical Surveys, Post Office, and the Royal Canadian Mounted Police. Problems pertaining to Eskimo economy and welfare were dealt with. Medical surveys and medical and dental treatment were given where required. Extensive soundings were taken over the routes followed and other hydrographic data were compiled. Post offices and Royal Canadian Mounted Police detachments were inspected and supplied.

Representatives of this Department visited most centres not serviced by the Eastern Arctic Patrol during the year. Travelling by air, a party visited all the settlements on the west side of Hudson Bay as far north as Igloolik, and, in the Western Arctic, as far west as Holman Island and Coppermine. The party included representatives of the Arctic Division, Education and Welfare Service, the Canadian Wildlife Service, and the Royal Canadian Mounted Police. A representative of the Arctic Division also accompanied a Royal Canadian Mounted Police flight to settlements on the east side of Hudson Bay. The whole of the Aklavik district, extending from Herschel Island in the west to Paulatuk in the east, and including Sachs Harbour in Banks Island, was visited twice during the year by the sub-district administrator at Aklavik and officers of the Royal Canadian Mounted Police.

The C.G.S. *N. B. McLean* again patrolled Hudson Strait and Bay during the 1953 navigation season and gave ice information and other assistance to shipping using the Hudson Bay route. This vessel also supplied the radio stations in this area and made frequent calls at places on the northern Quebec coast where the ship's doctor gave medical attention when required. The Hudson's Bay Company motor vessels *Rupertsland* and *Fort Garry* carried supplies for the Company's trading posts and to various government establishments. The motor vessel *Fort Hearne* returned to the Western Arctic after being overhauled in Vancouver and distributed supplies for the Western Arctic with the assistance of the *Nigalik* and *Nechilik*.

Ice conditions throughout most of the Arctic were normal and no serious difficulties were encountered anywhere during the season.

Health and Welfare

Two isolated groups of Eskimos, temporarily short of food, had supplies flown to them. Otherwise, no serious shortages occurred and there have been no epidemics apart from colds. Treatment of tuberculosis continues to be the main concern of the Department of National Health and Welfare and concerted efforts are being made throughout the Arctic to detect active cases and provide them with immediate treatment.

Coronation Medals

Twenty Eskimos were among the Canadian citizens honoured by the presentation of Coronation Medals. Those chosen were considered to have provided outstanding leadership or services in communities scattered across the Arctic from Fort Chimo in the east to Aklavik in the west, and as far north as Pond Inlet at the north end of Baffin Island.

Thomas Aneroluk from Coppermine and Simonee from Frobisher Bay were chosen to accompany the Department of Transport's icebreaker *d'Iberville* to the Coronation Review at Spithead.

The Arctic Institute of North America

Following up its expedition to the Barnes Icecap in eastern Baffin Island in 1950, the Institute sent another party to the Cumberland Peninsula, some 300 miles southeast of that locality. Both expeditions were led by P. D. Baird, Director of the Institute's Montreal Office, who has had extensive experience in Arctic work.

The objects of both expeditions were to carry out glaciological and geomorphological work on the Penny Highland icecap and in the Pangnirtung Pass area. Botanical and zoological studies were also made in the Pass area and ornithological investigations were carried out around the coast of Cumberland Peninsula. The 1953 party consisted of thirteen scientists, who were flown into Frobisher Bay by the Royal Canadian Air Force, and from there to Pangnirtung Pass by a chartered Norseman aircraft.

The Institute is a non-governmental agency, representative of interest on the part of Canadian and United States citizens in arctic and subarctic territory in this continent. It receives an annual grant of \$5,000 from the Government of Canada and financial assistance also from the Government of the United States, from foundations, from industry, and from private individuals. Its purpose is primarily to carry on fundamental research in the Arctic in a wide variety of scientific disciplines—physical, biological, geological, geophysical, glaciological, meteorological, archaeological and human. This is done by means of grants which assist the scientist to carry on work in the Arctic, where work is of necessity expensive. Altogether, some 140 projects have now been completed in the eight years since the Institute was established, and much new and important knowledge has been obtained of value to government agencies and to industry, and helpful as well for the welfare of the native peoples. The work is carried on in close relationship with the work of government agencies, but with the emphasis on fundamental research and with the fact in mind that the problems are similar and interrelated across political boundaries. Canadian and United States scientists join hands in this work.

A major enterprise of the Institute has been the preparing and issuing of an Arctic Bibliography, of which four volumes have been issued, and two further volumes are in preparation. This is the most extensive bibliography of any region that has been issued in any country, and gives reference to all papers that have been published on the Arctic, in any language, and states where each paper can be consulted. It is a work of very great value.

At a time when the Arctic areas in Canada and the United States are assuming greater importance, and are attracting wider interest, the work of the Arctic Institute of North America represents, to even a greater degree than hitherto, a national service.

Other Government Departments

Commercial Fishing

The 1953 summer commercial fishing season on Great Slave Lake was considered a financially successful operation. Although fewer boats were used and the production was somewhat below that of the previous summer, the average catch per vessel was greater.

The large quantities of ice put up the previous winter were nearly exhausted by September 1st which is a good indication that the industry is becoming more than ever aware of the need for preserving the quality of the catch. In addition to the two ice-houses built last summer, two more were under construction at locations close to production areas on the north shore.

During the 1953 summer season, 110 fishermen operated from 39 boats and produced 2,845,223 pounds of all species made up as follows: whitefish, 1,333,572 pounds;

trout, 1,496,191 pounds; pickerel, 2,573 pounds; inconnu, 11,371 pounds; pike, 1,516 pounds. Fishermen received 8 cents per pound for dressed whitefish, 10 cents for dressed lake trout, 3 cents for inconnu and pike, and 5 cents for pickerel.

A close observation of the fishery on Great Slave Lake was maintained by the Department of Fisheries' two patrol vessels. Chartered aircraft were also used to patrol the closed areas while the patrol vessels were working in the more remote parts of the lake.

Observances of closed areas were good this summer and there were no violations of regulations.

Owing to transportation problems none of the lakes adjacent to Great Slave were fished during the season.

Sport fishermen from nearly every state in the United States of America took part in the sport fishing activities at Taltheilei Narrows in the East Arm. Lake trout over 40 pounds in weight were taken by rod and line in this fisherman's paradise. Arctic grayling, pickerel and northern pike were also included in the catches of local and non-resident anglers.

The 1953-54 winter operation was delayed because of extremely mild weather in November and the early part of December. Production was light until the beginning of January.

Fifty-two fewer fishermen took part in the fishery this winter as compared with last winter. Although the production was lower by approximately 700,000 pounds the fishermen showed a higher net profit as the price of fish averaged six to eight cents more per pound during the season.

There were 108 resident licences, 181 non-resident licences and 88 Treaty Indian permits issued this winter on Great Slave Lake. Eight companies took part in the operations and produced 2,193,596 pounds made up of the following species; whitefish, 1,650,144 pounds; lake trout, 389,117 pounds; inconnu, 103,053 pounds; pike, 51,232 pounds; pickerel, 50 pounds.

Other lakes in the Northwest Territories fished commercially during the winter included; MacDonald for a total production of 19,999 pounds of whitefish and lake trout; Tathlina which produced 9,257 pounds of pickerel. Kakisa produced 71,790 pounds of pickerel and 424 pounds of pike. Thubun Lakes produced 9,809 pounds of whitefish and trout.

Licences Issued for these Lakes

<i>Name</i>	<i>Resident Licence</i>	<i>Non-resident</i>	<i>Treaty Permits</i>
MacDonald	2	2	1
Tathlina	Nil	Nil	2
Kakisa	3	7	2
Thubun	3	Nil	Nil

The marketed value of the production for the summer and winter operation was approximately \$1,755,000 which is a slight increase over the previous year. About 95 per cent of the total catch was sold in the fresh and frozen state to United States markets.

The winter patrol equipment consisted of two bombardier snowmobiles assisted by chartered aircraft which was used quite extensively during the early part of the season because of unsafe ice conditions.

The beluga or white whale fishery in the Churchill area of the Hudson Bay was not as successful this year as the previous summer's operation. A total of 559 beluga were captured which is a decrease of 140 from the 1952 catch.

A late break-up prevented the start of operations until June 28. Continual adverse weather curtailed hunting. Minor breakdowns of the reduction plant machinery all contributed to a poor summer operation.

• There was a 7 cents per pound drop in the price of oil produced.

A total of 20 hunters were licensed during the season, all experienced fishermen. They were paid at the rate of \$1.00 per foot length of beluga. They operated in two teams of four hunters each and six teams of two hunters each. One of the two-hunter teams had the highest kill of 172 animals.

The entire catch was processed into oil and ground meat for animal food at Churchill.

Law and Order

The Royal Canadian Mounted Police maintained law and order throughout the Northwest Territories. Police officers carried out many administrative functions at points where no departmental representatives were stationed, and assisted the wardens in forest and wildlife conservation work. During this year the Department of Justice assumed the responsibility for the administration of Justice in the Northwest Territories.

Scientific Surveys

Mineral Claim Surveys in the Yukon

Three survey parties headed by staff surveyors of the Department of Mines and Technical Surveys operated in the Yukon Territory. The first party completed the survey of 67 mineral claims in the Keno area and, in addition, surveyed seven lots near Mayo. The second party carried out miscellaneous legal surveys of 25 group lots and one subdivision. The third party carried out surveys of nine miscellaneous group lots, a control survey of a portion of the Whitehorse-Mayo Highway, and one subdivision survey.

At the request of the Lands Division two group lots were surveyed by a private surveyor. Instructions were issued to a private surveyor for survey of 115 mineral claims in the Mayo Mining District.

Mineral Claims Surveys in the Northwest Territories

Two parties headed by staff surveyors of the Department of Mines and Technical Surveys surveyed portions of the 34th base line east and west of the sixth meridian. Instructions were issued to private surveyors for surveys of 266 mineral claims in the Yellowknife and Mackenzie mining district. The western boundary of that part of Wood Buffalo National Park in the Northwest Territories was surveyed by a staff surveyor.

Geological Survey Field Work in the Yukon Territory

In the year 1953 eleven geological investigations were made by Department of Mines and Technical Surveys in the Yukon Territory. These involved mapping in six areas for publication on a scale of 1 inch to 4 miles, preparing standard 1-inch to 1-mile maps in two areas, reconnaissance surveying in one area, and detailed studies of the Keno Hill lead-silver ore and of the Triassic formations of Laberge area. These investigations were south of Latitude 64 degrees in areas tributary to the Alaska Highway or Yukon River, and were planned to provide information to assist prospecting and to aid in the expansion of the present mining operations.

Geological Survey Field Work in the Northwest Territories

In the Northwest Territories special attention was directed to preliminary geological surveys of extensive areas of the larger islands of the Arctic Archipelago. The north coast of Ellesmere Island was traversed, also the coastal area of southern Baffin Island. The study of a part of Ellef Ringnes Island, including a circular structure resembling the surface expression of a salt dome, was completed. The mapping of Cornwallis Island was finished for the present. The detailed study of the Yellowknife gold belt,

in progress since 1946, was finished and final reports based on these studies are now in preparation. Mineral discoveries in the Yellowknife district were examined, and the mapping of the O'Connor Lake lead area was completed.

Public Health and Medical Care

Medical attention to all non-industrial areas in the Northwest Territories except Yellowknife continued to be provided by medical officers and field nurses of the Department of National Health and Welfare. While these officers were concerned specifically with the health of Indians and Eskimos, their services have been available to all residents either through visits or by the use of the expanding radio facilities.

Hospitals in the same areas were operated as in the past by missionary societies. All hospital services were improved, notably at Fort Smith where a new enlarged hospital replaced the previous building and at Aklavik where a number of additional beds were brought into use.

Emphasis continued on public health activities through more frequent visits by medical officers and a dental surgeon to regularly accessible communities. Tuberculosis was sought for vigorously by surveys in the Western Arctic and by the Eastern Arctic Patrol in addition to the constant search at all health centres. The incidence appeared slightly less in the Eastern but quite substantially less in the Western Arctic. There was not any serious epidemic and health in general continued at a satisfactorily high level.

Aside from an increase in hospital beds and the establishment of a public health nurse at Fort Smith, there was not any noteworthy extension of treatment facilities but the ground work was laid for a new division within the Department of National Health and Welfare to be known as Northern Health Services and designed to concentrate on the co-ordination of existing health services or to plan for future requirements. Officers of Northern Administration and Lands Branch provided initiative and active support to this innovation which will intensify the continuous interest of the Administration in the health of all residents of the North.

NATIONAL PARKS BRANCH

The national parks continue to be a major tourist attraction in Canada and upwards of ten per cent of the people who came to this country in the last fiscal year, visited the parks. Increased numbers of visitors were reported for 12 of the 17 national parks and five of the 11 national historic parks, the aggregate reaching 3,137,725, a rise of 18 per cent above the 1952-53 figure.

To keep pace with the growing pressure on national parks facilities, camp-grounds and picnic areas were developed and extended. Parking areas were enlarged and bowling greens, tennis courts, and swimming and boating facilities were improved or developed in a number of parks. Additional playground equipment was provided.

New construction included additions to bungalow camp accommodation by concessionaires. Notwithstanding these additions, accommodation was overtaxed, particularly during the months of July and August.

An important part of the funds provided by Parliament was devoted to the improvement and extensions of main, secondary, and fire roads and to the maintenance of trails and telephone lines. The restocking of park waters with game fish was continued and more than 350,000 trout plantings were made.

There were fewer fires in the national parks than in the previous year and the combined area burned over was confined to less than 50 acres. Suppression costs were down a third from last season and lightning was held responsible for 50 per cent of the outbreaks. Careless smokers were the next highest cause, 16 per cent of the fires being traceable to them.

The Historic Sites and Monuments Board assumed its duties as a statutory board at its 1953 Annual Meeting. The National Parks and Historic Sites Division marked or acquired 18 sites during the year on the advice of the Board and five others were recommended for attention. The total number of sites acquired or marked is now 477, with 188 awaiting action.

Amendments to the Migratory Bird Regulations were adopted with a view to effecting greater control of crop depredations. Within the national parks, investigations were conducted by the Wildlife Division into the numbers and distribution of big game animals. Studies were conducted on animal diseases and on waterfowl breeding and sport fishing conditions. In the Northwest Territories long term investigations were continued into the relationship of fur-bearing animals, marine mammals, and big game to the general economy of the north and the welfare of its residents. Wildlife officials participated in conferences of national and international scope and co-operation was extended to other scientific services, conservation organizations, and agencies.

The National Museum of Canada conducted field investigations and collections in seven of the ten provinces and in the Northwest Territories. Investigations and special assignments involved zoology, botany, archaeology, and ethnology. From the results of these investigations and from donations received the National Museum was again able to add considerably to its collections of materials and specimens. The Educational Service of the Museum conducted its series of lectures and film showings. Considerable work was done on exhibits and on the preparation and distribution of written material including special articles, reviews, and bulletins. The National Museum auditorium was used extensively by scientific and related organizations for the adult lecture series.

National Parks and Historic Sites Division

Canada's system of national parks comprises 17 national parks and 11 national historic parks which range in size from a few acres to hundreds of square miles. The locations of these units are indicated on the map accompanying this report. The parks are administered under the authority of the National Parks Act and Regulations made thereunder.

Funds provided by Parliament permitted a diversified program of development in addition to regular maintenance. Highway construction and improvement was continued, the main projects being in Jasper, Riding Mountain, Cape Breton Highlands, and Prince Edward Island National Parks. Additional accommodation for visitors was provided by private enterprise in the parks, the most notable addition being the new Jasper Park Lodge which replaced the original building destroyed by fire in 1952. A new cabin development was completed by the Department in Elk Island National Park and leased to a concessionaire.

New camp-grounds and picnic grounds were established and accommodation at others was extended and improved. Outdoor swimming pools and bath-houses at the hot mineral springs in Banff, Jasper, and Kootenay National Parks were well patronized, each establishment reporting an increase in attendance over the previous year. Other recreational features available to visitors were extensively used and numerous conventions, tournaments and other gatherings were held at park centres.

Additional improvements to the Halifax Citadel and fortifications in Nova Scotia were continued and a start was made on the improvement and restoration of Dufferin Terrace in Quebec City.

Title was acquired to three acres in the vicinity of Mallorytown Landing as an extension to St. Lawrence Islands National Park and to a small area of freehold land near Lake Louise Station in Banff National Park. In addition, two privately owned buildings in Jasper National Park were purchased for departmental use.

Travel to the Parks

The number of visitors to the National Parks during the year reached 3,137,725, constituting an all-time attendance record. The largest increases were recorded at Point Pelee, Riding Mountain, Banff, Kootenay, Elk Island and Jasper National Parks, in the order named. Interest in the Halifax Citadel, where restoration work was carried out on a broad scale, was reflected in increased patronage.

The number of visitors to each park, and comparative figures for the previous year, are shown in the following statement, which does not include inter-park travel in the three-park unit consisting of Banff, Kootenay, and Yoho National Parks:

Comparative Statement of Visitors to the National Parks
for the Fiscal Year, April 1 to March 31

<i>National Parks</i>	1953-54	1952-53	<i>Increase or Decrease</i>
Banff	661,700	594,281	+ 67,419
Cape Breton Highlands	33,610	35,372	— 1,762
Elk Island	177,482	136,720	+ 40,762
Fundy	107,793	101,139	+ 6,654
Georgian Bay Islands	14,425	9,417	+ 5,008
Glacier	714	1,021	— 307
Jasper	132,063	104,103	+ 27,960
Kootenay	231,261	173,158	+ 58,103
Mount Revelstoke	15,742	14,661	+ 1,081
Point Pelee	445,270	323,526	+121,744
Prince Albert	118,720	105,034	+ 13,686
Prince Edward Island	146,827	122,290	+ 24,537
Riding Mountain	494,304	409,518	+ 84,786
St. Lawrence Islands	37,076	42,856	— 5,780
Waterton Lakes	207,533	195,562	+ 11,971
Yoho	32,748	41,003	— 8,255
Sub-total	2,857,268	2,409,661	+447,607

<i>National Parks</i>	1953-54	1952-53	<i>Increase or Decrease</i>
<i>National Historic Parks and Sites</i>			
Fort Anne	19,297	20,558	— 1,261
Fort Battleford	11,391	11,259	+ 132
Fort Beausejour	21,430	23,249	— 1,819
Fort Chambly	72,320	78,312	— 5,992
Fort Lennox	8,829	9,668	— 839
Fortress of Louisbourg	20,497	19,050	+ 1,447
Fort Malden	17,418	15,564	+ 1,854
Fort Wellington	8,134	8,562	— 428
Halifax Citadel	85,395	45,130	+ 40,265
Port Royal Habitation	15,746	15,168	+ 578
Sub-total	280,457	246,520	+ 33,937
Grand Total	3,137,725	2,656,181	+481,544

Special Events

His Excellency the Governor General visited Fundy National Park in August where he was the guest of honour at a banquet arranged by the Mayor of the City of Moncton, N.B. Other distinguished visitors to the parks included Sir Archibald Nye, High Commissioner for the United Kingdom and Lady Nye at Cape Breton Highlands National Park; the Hon. Douglas McKay, United States Secretary of the Interior, and the Hon. J. Hugo Aronson, Governor of Montana, at Waterton Lakes National Park; Hon. G. Mennen Williams, Governor of Michigan at Jasper National Park, and Mr. Mohammed Ali Baig, High Commissioner for Pakistan, at Prince Albert National Park.

The Trail Riders of the Canadian Rockies and the Sky-Line Trail Hikers held annual camps in the Baker Lake District in Banff National Park. The Indian Days celebration in July 1953, and the Winter Carnival in February 1954, attracted many visitors to Banff. The Provincial Tennis Championship Tournament was held in Jasper National Park in July and the park was the locale for scenes in the feature films "Rose Marie" and "The Far Country". "River of No Return" was filmed partly in Banff and partly in Jasper National Parks, and "Saskatchewan" was photographed principally in the vicinity of Banff in Banff National Park.

The Alpine Club of Canada held its annual camp at the foot of Scott Glacier in Jasper National Park near historic Athabasca Pass. Alpine enthusiasts also staged outings at Lake O'Hara in Yoho National Park and in Glacier National Park. Curling bonspiels were held in Banff and Jasper National Parks in January, 1954. Other winter sports events included the intercollegiate ski meet at Banff sponsored by the University of Alberta, the ski camp of the Alpine Club of Canada at Skoki Lodge in Banff National Park, and a ski meet in the Marmot Basin area at Jasper in early spring.

Maintenance and Improvements

Roads and Bridges

Highway improvement projects, although not as extensive as in previous years, resulted in improvement to approximately 120 miles of park highways and secondary roads. Of this total, 15 miles were resurfaced with gravel, and the remainder was surfaced with gravel or with asphalt.

In Jasper National Park, the Banff-Jasper Highway was given an asphalt coat from Mile 20 to Mile 49. Reconstruction of seven miles of this highway from Mile 48.7 to Mile 55.7 was completed. This work involved grading to a new standard width of 34 feet compared with the previous width of 26 feet. Replacement of the bridge over the Miette River at Mile 1 was completed and a start was made on the replacement of bridges at Sulphur Creek and Villeneuve Creek on the Miette Hot Springs Road.

In Banff National Park, five and a half miles of the Trans-Canada Highway between Banff and the Eastern Gateway were surfaced with an asphalt-bound course. In addition, the location survey for this highway was carried out to the west boundary of the park. Repairs were made to the superstructure of Baker Creek bridge. The approaches to the new Bow River bridge near Lake Louise Junction were completed and a reverse curve on Lake Louise Hill in the vicinity of Mile 38 was reduced to improve the grade. On the Banff-Jasper Highway, a location survey was carried out for a distance of 25 miles south from the north boundary of Banff National Park and for a distance of five miles northerly from Bow Summit. Extensive improvements were made to the approach lanes at the Eastern Gateway.

In Yoho National Park, some clearing of the Leancoil section of the Trans-Canada Highway was carried on. All park roads were graded and gravelled where required.

In Kootenay National Park, maintenance of the Banff-Windermere Highway was carried on and widening of the right-of-way to improve alignment was completed west of Sinclair Canyon. A section of a concrete retaining wall in the Sinclair Canyon section, which collapsed in August, 1953, was repaired by the installation of a reinforced concrete culvert.

In Mount Revelstoke National Park, gravelling and surfacing of the main highway was carried out and several culverts replaced.

All roads in Waterton Lakes and Prince Albert National Parks were maintained. The entire road system in Elk Island National Park involving 18 miles was resurfaced with road oil and culverts were replaced as required. Highway No. 10 in Riding Mountain National Park was seal-coated with an asphalt surface. The main park road in Point Pelee National Park, approximately six miles in length, was asphalt seal-coated. Maintenance was carried out on Highway No. 14 in Fundy National Park and more than 5,000 feet of guard railing installed. Approximately two and a half miles of road in the vicinity of Middlehead in Cape Breton Highlands National Park was surfaced with asphalt. In addition, three miles of the Cabot Trail in the vicinity of North Mountain were reconstructed. Ten miles of highway in Prince Edward Island National Park were given an application of asphalt and stone chips.

Trail Improvement

In Banff National Park, the fire trail on the south side of the Bow River was extended for three miles from Lake Louise Junction, and the Cascade fire trail was extended two and a half miles beyond Windy Cabin towards the Snow Creek Summit. A new fire trail was built from a point at Mile 8 on Spray River up Goat Creek. A trail bridge was constructed across the North Saskatchewan above the Alexandra River at Mile 103 near the Banff-Jasper Highway. Local trails for riders and hikers were also extended or re-routed and several new trails and fire roads constructed.

In Jasper National Park, three miles of the Fortress Lake fire trail were constructed and one mile of the Whirlpool fire trail was widened and a culvert installed. Nine miles of trail were cut along Moosehorn Creek in the Miette district. In the Athabasca Falls district a log bridge was built over Hardisty Creek on the Buffalo Prairie trail. Six

miles of new pony trail were cut along Vine Creek, upstream from the Devona fire trail, and four miles of the Cabin Lake trail were constructed and both pony and foot bridges erected.

In Kootenay National Park, trail work included minor improvements, bridge repairs, and culvert installations.

In Yoho National Park, four new bridges were built on the Emerald Lake trail and construction started on a fire road from Leancoil to Otterhead. Replacement and repair of bridges on other trails was given particular attention.

In Glacier National Park, new bridges were constructed on the Asulkan and Great Glacier trails and repairs and general maintenance to a number of other trails were made.

In Mount Revelstoke National Park, the Greely trail was extended about one and a half miles, two miles of other trails were improved and about 340 feet of new bridges and corduroys constructed.

In Waterton Lakes National Park, the Bertha, Alderson, and Boundary trails were widened and improved to permit the passage of horses.

In Prince Albert National Park, improvements to the Moose Trail were made over approximately 15 miles, to join a section of the trail constructed in 1952.

In Riding Mountain National Park, all trails were kept passable by members of the Warden Service in conjunction with their regular patrols.

In Fundy National Park, the Shepody Trail was improved by gravelling and the installation of cedar culverts.

The walking trail between Still Brook and South Point in Cape Breton Highlands National Park was completed. Clearing and repair work was carried out on the fire trails.

Communications

In Jasper National Park, a number of forest telephone lines were converted from a grounded line circuit to metallic line circuit and from tree line to a pole line. A number of field telephone stations were installed along the Banff-Jasper Highway at three-mile intervals.

In Banff National Park, the forest telephone line from Eisenhower Junction to the boundary between Banff and Kootenay Parks was reconstructed.

A section of the main telephone line in Yoho National Park was relocated as a result of Trans-Canada Highway right-of-way clearing.

In Kootenay National Park, lines were relocated and several road crossings were eliminated. Sections of tree lines were transferred to poles.

The Oil Basin telephone line in Waterton Lakes National Park was reconstructed and relocated, reducing the length of the line by approximately three and one-half miles.

In Prince Albert National Park, the long distance and warden's telephone lines were moved from the old to the new central stores building.

In Riding Mountain National Park, poles were replaced along approximately 80 miles of telephone line. A section of line was relocated in an area where service was disrupted by the activities of beaver.

In Fundy National Park, nine forest telephones were installed on the new metallic circuit line from Park Headquarters to Lake View.

Following is a statement of mileage of roads, trails, and telephone lines in National Parks:

Mileage of Roads, Trails and Telephone Lines

<i>National Park</i>	<i>Motor Roads</i>	<i>Secondary Roads</i>	<i>Fire Roads</i>	<i>Trails</i>	<i>Telephone Lines</i>
Banff	181.15	.....	116.75	711.75	278.75
Cape Breton High.	50.80	5.00	25.23	23.25	3.34
Elk Island	18.00	.....	.....	20.00	18.00
Fundy	21.40	7.00	27.30	26.00	.....
Glacier .....	.....	.....	25.75	106.50	2.00
Jasper	162.50	9.00	84.50	575.50	368.95
Kootenay	60.60	.....	36.50	138.00	60.00
Mt. Revelstoke ...	18.50	.....	.....	58.25	11.00
Point Pelee	6.58	2.50	.....	.....	.....
Prince Albert	65.70	75.75	.....	268.75	129.00
P.E.I.	12.00	5.00	.....	3.50	.....
Riding Mt.	58.50	50.90	.....	119.00	227.00
Waterton Lakes ...	48.30	13.50	.....	151.90	71.50
Yoho	45.00	.....	29.00	209.00	72.50
Total	749.03	168.65	345.03	2,411.40	1,242.04

Buildings

Ninety-seven building permits were issued in Banff National Park covering new construction, alterations, and additions. Private construction in the townsite of Banff included 13 residences, a private museum, and six cabins in motel developments. Outside the townsite, construction included buildings for the National Cadet Camp, cabins in bungalow camps, and a house on freehold property at Anthracite. Departmental buildings erected included a staff quarters building at the eastern gateway, a public convenience building at Mount Norquay, and two warden cabins—one in Ptarmigan Valley and the other at Mile 8 on Spray River.

In Jasper National Park, 117 building permits were issued. In the townsite a new departmental staff residence was erected, improvement work was carried out at the swimming pool including renovation of the boiler system, and work on the new industrial compound area adjacent to the town was continued. Outside the townsite a new warden's residence was constructed, repairs and improvements were completed at Miette Hot Springs bath-house, and two warden patrol cabins were erected.

In Kootenay National Park, part of the original Gateway Building was demolished and a temporary registration kiosk erected at the western park boundary. Foundations and footings were poured for the new west entrance buildings and two new staff residences were erected. Additional cabin accommodation for tourists was constructed by private enterprise.

In Mount Revelstoke National Park, construction of three new bungalow cabins was commenced. These buildings, when completed, will increase existing accommodation at Heather Lodge.

In Glacier National Park, a concrete foundation was poured for a new bunkhouse.

In Yoho National Park, a new residence for the park engineer was constructed and progress was made in the construction of a new warden's residence at Leancoil.

In Waterton Lakes National Park good progress was reported on a number of construction projects including an addition to the bunkhouse, carpenter shop, paint shop, warden house, and four staff garages.

In Prince Albert National Park, a new central stores building, started in 1952, was completed. A new warden cabin was built at the north end of Kingsmere Lake. The residence for the park engineer was moved to a new location and in two warden districts implement storage sheds were erected.

In Point Pelee National Park, three life-guard towers and five bath-houses were constructed on the public beaches.

Departmental construction at Fundy National Park included a new warden's residence, a three-car garage, an implement shed, and a fire equipment building. In Cape Breton Highlands National Park construction included a warehouse at Cheticamp Entrance, toilet and laundry building at Headquarters Camp-ground, living quarters for life guards, and a paint and carpenter shop. A warden cabin in the Warren Brook District was nearing completion and a garage was erected at the warden station at Big Intervale. A vehicle and equipment garage was completed at Dalvay Beach in Prince Edward Island National Park.

Townsites

In the Townsite of Banff 1,200 feet of curb and gutter and 3,000 feet of asphalt sidewalks were completed. Lawns and walks were extended at the Administration Building grounds and improvement work carried out on the central park and behind the museum. The storm sewer "A" line system was extended by 15,270 feet on Wolf Street and on streets in the section northeast of that sewer line. This entailed the installation of 52 manholes and 107 catch basins and the connecting of 20 existing catch basins, which formerly were connected to the sanitary system. In Blocks 41 and 42 trunk sewer was installed and in Villa Block 4 sewer and water lines were laid in developing this area for townsite extension.

In Jasper, asphalt sidewalk resurfacing was carried out on Connaught Drive, Miette Avenue, and Patricia Street. The new off-street parking spaces were graded and gravelled. Dust prevention measures were carried out on gravel surfaced streets.

In Radium Hot Springs, (Kootenay National Park) water and sewer services were extended to take care of new residences under construction. In Field, (Yoho National Park) new concrete sidewalk construction was carried out in two blocks on Kicking Horse Avenue. In Waterton Park seal-coating with asphalt was completed on a number of streets. The new water system was almost completed and a new sewer system was put into operation.

In Waskesiu, (Prince Albert National Park) concrete sidewalks and gutters were constructed on a number of streets and additional light standards were erected along Waskesiu and Montreal Drives. The erection of a 104,000-gallon elevated steel water tank was partially completed. In Wasagamung, (Riding Mountain National Park) where all of the main streets and sidewalks in the townsite have been hard surfaced, maintenance work was undertaken on a greatly reduced scale.

Accommodation for Park Visitors

Additional tourist accommodation was provided in several parks, principally by private enterprise. The most notable project completed was the new Jasper Park Lodge which replaced the original destroyed by fire in 1952.

The cabin development acquired by the Department in 1952 in Elk Island National Park was completed and, following a call for tenders, was licensed to a concessionaire. This development contains 19 fully serviced house-keeping cabins. Other accommodation provided during the year included the following: Yoho National Park, three cabins; Kootenay National Park, nine bungalows and a duplex cabin; Banff National Park, an eight-unit motel; Prince Albert National Park, two cabins and a nine-unit motel; Riding Mountain National Park, three bungalows and a twenty-four room lodge. Progress also was made in the construction of a four-cabin development in Mount Revelstoke National Park.

In Yoho National Park a youth hostel was established on a site near Kicking Horse camp-ground east of Field. The three buildings comprising the hostel were transferred from Jasper National Park.

Public camp-ground facilities were extended to improve accommodation for those travelling with trailers or carrying their own camping equipment. Additional kitchen shelters, water, sewer and electrical connections for trailers, enlarged parking space, and barbecue pits were provided in a number of the parks. New camp-grounds were established at Bow Summit in Banff National Park and at the western end of the Cavendish Beach in Prince Edward Island National Park. In Waskesiu Townsite in Prince Albert National Park, camp-ground facilities were extended to provide for 58 portable cabins. In Elk Island National Park a two-acre addition to the Sandy Beach camp-ground was made and additional camp stoves, tables, and other features were provided.

The camp-ground near Park headquarters in Fundy National Park was enlarged to accommodate an additional 50 cars. This site now contains a new comfort station, a large community kitchen, and a three-hole barbecue pit. A new camp-ground was constructed at Point Pelee National Park with water supply and sewage disposal systems, and electricity provided. This camp-ground also provides accommodation for 15 trailers.

Recreation

Numerous facilities for recreation in the parks were well patronized by visitors. Two large picnic shelters at Banff were erected at the recreation grounds south of Bow River and the development of a new picnic area was commenced at Corral Creek on the Banff-Lake Louise Highway. Attendance at the Cave and Basin and Upper Hot Springs bath-houses at Banff totalled 229,458, an increase over the previous year. A new museum building containing a notable collection of Indian and historical exhibits was opened at Banff. This building is operated by private enterprise and visitors are admitted without charge.

The new Aquacourt at Radium Hot Springs in Kootenay National Park had a total attendance of 152,440, an increase of 30,000 over the previous year. In Jasper National Park, the bathing facilities at Miette Hot Springs attracted 34,265 patrons. At Waterton Lakes National Park, the conversion of greens on the golf course from an oiled-sand type to grass was completed. The outdoor theatre in the public camp-ground adjoining Waterton Park Townsite was well patronized by visitors attending the film showings staged regularly during the summer season.

A new bowling green and three tennis courts were completed and made available at Elk Island National Park. In Riding Mountain National Park, swimming and boating facilities were improved by the construction of three new piers in Clear Lake. Five portable bath-houses were erected on the beach at Point Pelee National Park and additional playground equipment installed in the recreational area at the southern end of the park. Several new wells, a number of camp-ground shelters and stoves were provided for the use of visitors.

In all parks a determined effort was made to provide additional parking space adjoining playgrounds and recreational areas.

Winter sports facilities were extended by the improvement of ski slopes and the opening of new trails in several parks. In Jasper National Park, a new run was opened on the upper slopes of The Whistlers Mountain. The Jasper Park Ski Club installed a new ski tow of the Pomalgaski type on the hill and relocated the club-house building at a higher elevation. Improvement to the ski slopes and additional clearing on the ski runs at Mount Norquay in Banff National Park were carried out. In addition the North American run was widened and extended almost to the floor of the Bow River Valley.

Conservation Services

Forest Protection

Thirty fires were reported in the National Parks during the 1953 fire season and the area burned over comprised 49·8 acres. The largest fire occurred in Riding Mountain National Park in May, when 25 acres was burned over. Damage to timber, young growth and other property amounted to \$1,751.77 which is a little more than one-third of the loss in 1952. It is interesting to note that 76·6 per cent of all fires reported were under one-quarter acre in size.

Classified according to causes, careless smokers were responsible for 16·7 per cent; campers 13·3 per cent; railways and public works 6·7 per cent each; incendiary and miscellaneous 3·3 per cent each, and lightning 50 per cent.

Fire Losses in the National Parks, 1952 and 1953

National Park	Number of Fires		Area Burned (Acres)		Cost of Suppression	
	1952	1953	1952	1953	1952	1953
Banff	8	10	13·25	0·54	\$ 1,773.12	\$ 436.62
Jasper	6	3	3·75	9·3	115.78	1,244.02
Glacier	2	5	Spot	3·3	131.20	282.48
Kootenay	0	3	0	0·1	0.00	156.95
Yoho	1	2	Spot	5·1	32.01	2,958.04
Mount Revelstoke	0	3	0	Spot	0.00	222.20
Waterton Lakes	0	1	0	Spot	0.00	0.00
Elk Island	1	0	150·0	0	78.80	0.00
Prince Albert	1	1	18,995·0	5·0	7,156.00	723.57
Riding Mountain	6	1	577·25	25·0	312.31	1,587.85
Georgian Bay	0	0	0	0	0.00	0.00
St. Lawrence Is.	3	0	·25	0	14.80	0.00
Point Pelee	0	0	0	0	0.00	0.00
Fundy	1	0	45·0	0	2,239.00	289.00*
Prince Edward Is.	0	0	0	0	0.00	0.00
Cape Breton Highlands	5	1	Spot	1·5	14.50	28.40
	34	30	19,784·5	49·84	\$11,867.52	\$7,929.13

* Fire-fighting outside park in co-operation with Province of New Brunswick.

Improvements in Fire-Fighting Equipment

Fire-fighting equipment purchased was mainly replacement, and included such large items as 5 portable gasoline-driven fire pumps, 19,200 feet of 1½-inch unlined linen fire hose, 3,000 feet of 1½-inch rubber lined fire hose, 800 feet of 1-inch unlined fire hose, 2 patrol boats, 2 rubber boats, 3 outboard motors, 24 gasoline-carrying cans, 6 dozen axes, 2 dozen "Pulaski" fire-fighting tools, 2 "Harodike" portable canvas tanks, 8 hose-carrying canvas bags and 18 water bags with hand spray pumps.

Fire Weather Conditions

Weather conditions throughout the National Parks from the Maritime Provinces to British Columbia were generally favourable. In the Mountain Parks of Alberta and British Columbia periods of extreme fire hazard were few and in no case exceeded two consecutive days in one period. In the Prairie Parks the usual spring hazard was experienced in May, and in Prince Albert National Park short periods of high hazard occurred throughout the summer, but from July to September frequent rains, well distributed throughout the park, prevented any prolonged build-up of high danger conditions. In the parks of Ontario and the Maritime Provinces well distributed rainfall kept the fire danger within safe limits.

All fire danger stations in Banff, Jasper, and Waterton Lakes National Parks were in operation from June till September, and in Yoho, Prince Albert, Riding Mountain, and Cape Breton Highlands National Parks from early in May until the end of October.

Insect Control

Investigations dealing with infestations of forest insects in the Mountain Parks were continued by entomologists of the Department of Agriculture, from their field headquarters at Mount Eisenhower in Banff National Park. Sampling of lodgepole pine needle miner infestation in Jasper National Park indicated a slight spread but the attack is light to moderate. Twenty sample plots were established in Jasper National Park for the purpose of checking on the forest insect population.

An outbreak of forest tent caterpillar occurred in Prince Albert National Park covering a large area of poplar around Waskesiu, Crean, and Kingsmere Lakes. Damage was moderate and most of the defoliated poplars were in full leaf again by mid-July. An egg survey carried out by forest biology rangers indicated that an infestation covering the same area may be expected in 1954.

The spruce budworm was reported causing damage to balsam fir and spruce in Cape Breton Highlands National Park and at Prince Edward Island National Park some defoliation of white spruce by this insect was noted.

Disposal of Timber

The cutting of green timber in the National Parks is permitted for beneficial thinnings or forest protection purposes. Besides timber cut for use of the National Parks Administration, the only major operation was in Riding Mountain National Park where limited selective cutting was carried out under the control of a forest working plan. All cutting under this plan is carried out by local settlers, who are issued permits for small quantities of saw-timber and other products for their own use. During the winter of 1953-54 a total of 1,157 timber permits was issued for 3,014,850 feet board measure of saw-timber, 2,063 cords of firewood, 12,675 posts, 110,705 linear feet of poles and 10,295 trees.

In Prince Albert National Park, a total of 52 permits was issued authorizing the removal of 323,981 feet board measure of sawlogs and 1,090 cords of fuelwood, all fire killed. In addition 185,300 feet board measure of coniferous saw-timber was cut for use of the parks administration. Also 500 cords of fuelwood were cut for use in camp-grounds and public buildings in the park.

Coniferous saw-timber cut for Parks' use in Banff and Jasper National Parks amounted to 279,000 feet board measure.

Mammals in National Parks

The buffalo herd in Banff paddock was reduced by 11 head, because of deterioration of the available pasture. The meat was donated to the Banff Indian Days Committee for the next annual celebration and the hides were sold. In accordance with the usual practice of reducing the number of elk in areas where population exceeds the carrying capacity, 75 animals were slaughtered. The meat and hides were given to the Indian Affairs Branch, Department of Citizenship and Immigration.

In Jasper National Park it was considered advisable to reduce the elk herd by 60. The meat and hides were given to the Department of Citizenship and Immigration.

To reduce an over-abundance in Prince Albert National Park, 276 beaver were trapped and pelted, and the pelts were sold at public auction. Beaver in certain areas in this park appeared to be affected by an unknown disease, and an investigation of this disease was commenced. On account of an outbreak of rabies in close proximity to the western boundary of the park, control measures to reduce the number

of predators in the park, commenced in 1952-53, were resumed. The buffalo herd in the park was reduced by seven, the meat being put into cold storage for use at the park work camp, and the hides retained for departmental use.

A reduction of 22 head was made in the buffalo herd in the exhibition pasture at Lake Audy, Riding Mountain National Park. The meat was sold by tender and the hides were retained for departmental use. The condition of the predatory animals in this park appeared to be normal.

The buffalo herd in the enclosure at Waterton Lakes National Park showed an increase and appeared to be in excellent condition.

An eastern cougar was seen by a park warden in Fundy National Park.

Gifts of Live Animals

Live animals were donated or loaned as follows: from Banff National Park—one pair of Rocky Mountain sheep donated to the Calgary Zoological Society, and one male and two female Rocky Mountain sheep donated to the Board of Parks and Recreation, Winnipeg; from Elk Island National Park—one male and two female buffalo donated to the Hill City Zoo, Rapid City, South Dakota, and two yearling buffalo loaned to the Moose Jaw Wild Animal Park Society; from Jasper National Park—one male and two female Rocky Mountain sheep donated to the Quebec Zoological Gardens, Charlesbourg, Quebec.

Statement of Large Mammals in Fenced Enclosures
in National Parks, March 31, 1954

	<i>Buffalo</i>	<i>Elk</i>	<i>Moose</i>	<i>Mule deer</i>	<i>White-tailed deer</i>	<i>Total</i>
Banff Park Paddock	8	.....	.....	.....	.....	8
Elk Island Park	1,151	840	360	30	45	2,426
Prince Albert Park Paddock	10	.....	.....	.....	.....	10
Riding Mountain Park Paddock	45	195	3	.....	37	280
Waterton Lakes Park Paddock	10	.....	.....	.....	.....	10
Total	1,224	1,035	363	30	82	2,734

Fish Culture Activities

More than 350,000 trout were planted in park waters, from hatcheries located in Jasper, Banff, and Waterton Lakes National Parks. Details concerning numbers, species and locations of fish planted in waters of the Mountain Parks and of Wood Buffalo National Park are given in the following table. Nearly one-half of all fish planted in Jasper National Park waters were marked by the removal of one or more fins before being planted. This extensive marking program again provided important data concerning the contribution of hatchery products to anglers' catches, and indicated the necessity of heavier future stocking in certain waters to improve angling opportunities.

Fifteen thousand eggs secured from a selected strain of rainbow trout were donated by the Department of Conservation, Wisconsin, U.S.A. The eggs were hatched at the Jasper hatchery.

Nearly 5 million common whitefish eyed-eggs were released in Lake Minnewanka in Banff National Park in conjunction with a lake trout management program undertaken at that lake. The Game and Fisheries Branch of the Manitoba Department of Mines and Natural Resources supplied the eggs.

Trout Plantings from National Parks Hatcheries During 1953

Species	Banff Park	Jasper Park	Waterton Lakes Park	Yoho Park	Kootenay Park	*Wood Buffalo Park	Total
<i>Rainbow Trout</i>							
Fingerlings	2,000	1,000	.. ..	.....	.....	.....	3,000
Yearlings	120	28,650	.....	.....	.....	.....	28,770
<i>Cutthroat</i>							
Fingerlings	261,400	.....	.....	.....	.....	.....	261,400
<i>Eastern Brook Trout</i>							
Fingerlings	9,500	3,000	200	1,810	9,900	10,000	34,410
Yearlings	258	11,487	100	.....	.....	.....	11,845
<i>Lake Trout</i>							
Yearlings .....	.....	3,650	.....	.....	.....	.....	3,650
<i>Splake (LT xEBT hybrid)</i>							
Fingerlings .....	.....	5,750	.....	.....	.....	.....	5,750
Yearlings .....	.....	1,834	.....	.....	.....	.....	1,834
Total	273,278	55,371	300	1,810	9,900	10,000	350,659

* Transferred from Jasper Park Fish Hatchery.

The three hatcheries located in Jasper, Banff, and Waterton Lakes National Parks continued to be an important attraction to visitors. More than 50,000 persons viewed display panels, as well as fish of different sizes and species being reared in troughs and ponds. Regular lectures were given at tourist establishments during the summer season by the hatchery officers.

The waters of Prince Edward Island and Cape Breton Highlands National Parks were stocked with 5,000 and 14,000 eastern brook trout respectively, during the year. All the fish stocked were marked by the removal of one fin. The Cheticamp and North Aspy Rivers received 12,100 and 10,000 yearling salmon respectively. All fish introduced into waters of the Eastern National Parks were supplied by the Department of Fisheries.

National Historic Parks and Sites

The National Parks and Historic Sites Services are entrusted with the restoration, preservation, and administration of the National Historic Parks and Sites, and the commemoration of the public services of outstanding personages in Canadian history. The Historic Sites and Monuments Board of Canada, an honorary body of recognized historians, representing the various provinces of Canada acts in an advisory capacity to the Minister in this work. The Board was placed on a statutory basis by the Historic Sites and Monuments Act in 1953.

The following comprise the personnel of the Board: Professor Fred Landon, London, Ont. (chairman); Professor D. C. Harvey, Halifax, N.S.; the Honourable E. Fabre-Surveyer, Montreal, Que.; the Reverend Antoine d'Eschambault, Genthon, Man.; Professor M. H. Long, Edmonton, Alta.; Dr. Walter N. Sage, Vancouver, B.C.; the Honourable Thane A. Campbell, Charlottetown, P.E.I.; Dr. Wm. Kaye Lamb, Dominion Archivist, Ottawa, Ont.; C. E. A. Jeffrey, St. John's, Nfld.; Dr. Alfred G. Bailey, Fredericton, N.B.; Campbell Innes, Battleford, Sask.; and Dr. F. J. Alcock, Chief Curator, National Museum, Ottawa, Ont. C. G. Childe, National Parks and Historic Sites Services, Ottawa, Ont., is Secretary.

The annual meeting of the Board was held in Ottawa, May 26 to 29, 1953, when matters relating to the background of Canada were reviewed. Of the many sites that have been considered by the Board to date, 477 have been marked or acquired and 188 others recommended for action.

National Historic Parks

At the Fortress of Louisbourg National Historic Park, N.S., restoration work was continued on the ruins of the hospital. The entrance road which had been damaged by heavy gales was repaired.

At Fort Anne National Historic Park, N.S., a new sewer system was installed and hardsurfacing was laid on the driveway. Many additional exhibits of interest were obtained for the museum.

At Port Royal National Historic Park, N.S., considerable protection work was placed along the river bank in front of the "Habitation". The road leading to Scots Fort was improved.

At Fort Beausejour National Historic Park, N.B., the heating system in the museum was repaired and a new display case was donated.

At Fort Lennox National Historic Park, Que., the old bridge at the south entrance was replaced and additional new flooring was laid in the men's barracks. The Department of Public Works widened the landing dock on the west side of the island and constructed a retaining wall and footpath from the landing dock to the roadway leading to the fort.

At Fort Malden National Historic Park, Ont., a burglar alarm system was installed in the museum building and in "Old Fort" building. A small foot bridge was constructed across the moat and crushed stone was spread on the driveway and paths. A model of Old Fort Malden was presented to the museum by the Hough family in memory of the late F. A. Hough, former owner of the present park.

At Lower Fort Garry National Historic Park, Man., which was transferred to the Canadian Government in 1951, subject to continuance of a lease to the Motor Country Club until the 31st of December, 1956, considerable restoration work was undertaken.

At Fort Battleford National Historic Park, Sask., additional display cases were obtained.

General maintenance work carried out in Fortress of Louisbourg, Fort Anne, Port Royal, Fort Beausejour, Fort Chambly, Fort Lennox, Fort Malden, Lower Fort Garry, Prince of Wales' Fort, and Fort Battleford National Historic Parks included painting of buildings, fencing, tables, benches, signs, etc.; repointing of buildings and walls; preservative treatment of roofs; cleaning of iron work; replacement of timbers; repair of fences; laying of flagstones, and care and extension of parking areas and picnic grounds.

National Historic Sites

Fort William, St. John's, Newfoundland.—A tablet was erected in the entrance lobby of the Newfoundland Hotel to mark the site of Fort William, built early in the seventeenth century. It was attacked three times by the French from Placentia and in 1696 Le Moyne d'Iberville destroyed the fort and settlement. Restored in 1697, it withstood an attack under Subercase in 1705, but in 1708 capitulated to St. Ovide de Brouillon who destroyed St. John's. In 1762 a force under Comte d'Haussonville, arriving from France, captured the fort. Troops led by Colonel William Amherst routed the French on Signal Hill and compelled d'Haussonville to surrender. The tablet was unveiled by the Hon. J. R. Smallwood, Premier of Newfoundland, on November 20, 1953.

Fort Townshend, St. John's, Newfoundland.—A cut-stone monument with tablet was erected in a small park at the intersection of Military Road and Harvey Road to mark the site of Fort Townshend, constructed in 1773-79 under Governor Lord Shuldham. It became the headquarters of the garrison and communication with Fort William was established by Military Road. In 1796, during the war with France, a French fleet which had approached the harbour withdrew after observing the strength of the defences. The garrison was disbanded in 1871. The monument was unveiled by the Hon. Lieut. Colonel Sir L. C. Outerbridge, Lieutenant-Governor of Newfoundland, on November 25, 1953.

The Sack of Lunenburg, Lunenburg, N.S.—A cut-stone monument with tablet was erected in Victoria Park to commemorate the Sack of Lunenburg. On July 1, 1782, while most of its men were absent, the Town of Lunenburg was invaded by a fleet of six sail from Boston, in reprisal for the capture of the Brig "Sally" in 1780. After taking the eastern blockhouse, with its defenders Colonel Creighton and five men, and occupying the western defences, the invaders then plundered the King's stores at the foot of King Street, the Shops, and principal houses. The tablet was unveiled on June 8, 1953, by Mr. J. Creighton of Lunenburg, a descendant of Colonel Creighton who defended the Town against the invaders.

The "Bluenose", Lunenburg, N.S.—A tablet was affixed to the Sack of Lunenburg monument in Victoria Park to commemorate the feats of the "Bluenose", 1921-1946, champion of the International Schooner Races, and symbol of the transformation of an inland people into leading deep sea fishermen of the North Atlantic. An additional

tablet bearing a likeness of the "Bluenose" in relief was also affixed to the monument. These tablets were unveiled on June 8, 1953, by Captain Angus Walters, who was skipper of the "Bluenose" throughout her fishing and racing career.

Margaret Marshall Saunders, C.B.E., Milton, N.S.—A tablet was affixed to the Masonic Hall to Margaret Marshall Saunders, author of "Beautiful Joe" which won for her international fame and membership in humane societies of America and Great Britain. She was born at Milton, April 13, 1861, and died in Toronto, February 15, 1947. The tablet was unveiled on September 12, 1953.

The Arts Building, University of New Brunswick, Fredericton, N.B.—A tablet was erected in the Arts Building marking it as the oldest existing university building in Canada. It was built in 1828 for King's College, later The University of New Brunswick and was opened by Sir Howard Douglas, Lieutenant-Governor of the Province, on January 1, 1829. The tablet was unveiled on February 16, 1953 by Dr. C. McN. Steeves of the University Senate.

Viscount Richard Bedford Bennett, Hopewell Cape, N.B.—A cut-stone monument with tablet was erected in a small park to Viscount Richard Bedford Bennett. Of early colonial stock, he practised law in Chatham, N.B., and for many years in Calgary, Alta., having moved to the Northwest in 1897. Elected from Calgary to the Legislative Assembly of the Northwest Territories in 1898, to the Alberta Legislature in 1909, and to Parliament in 1911, he was long in the forefront of public life and was Prime Minister of Canada from 1930 to 1935. Retiring in 1939 to live in England, he was raised to the peerage in 1941 as Viscount Bennett of Mickleham, Calgary and Hopewell. He was born at Hopewell, N.B., July 3, 1870 and died at Mickleham, England, June 27, 1947. The monument was unveiled by his brother, Captain R. V. Bennett, on October 16, 1953, the principal address being given by the Hon. Milton F. Gregg, V.C., Minister of Labour.

Sir Albert James Smith, K.C.M.G., Dorchester, N.B.—A boulder and tablet was erected on the grounds of the Court House to Sir Albert James Smith, jurist and legislator. He was Premier of New Brunswick, 1865-66, and Minister of Marine and Fisheries, 1873-78. He was born at Shediac, March 12, 1823 and died at Dorchester, June 30, 1883.

Louis Guillaume Verrier, Quebec, P.Q.—A tablet was affixed to the Law Faculty Building, Laval University, to Louis Guillaume Verrier. He was admitted to the Paris Bar in 1712, appointed Attorney General for the Superior Court of Quebec in 1728, and in 1733 founded the first law school north of Mexico. He was born in Paris, October 17, 1690, and died in Quebec, September 13, 1758. The tablet was unveiled on September 7, 1953.

Invention of the Telephone, near Brantford, Ont.—A cut-stone monument with tablet was erected at the Bell Homestead on Tutelo Heights to commemorate the invention of the telephone. Here at the home of his father on July 26, 1874, Alexander Graham Bell disclosed for the first time his conception of the principle of the telephone. The monument was unveiled under the auspices of the Brantford Board of Park Management and the Bell Telephone Company of Canada on September 12, 1953.

Honourable Arthur Sturgis Hardy, Mount Pleasant, Ont.—A tablet was erected in the Mount Pleasant Senior School to the Honourable Arthur Sturgis Hardy, Provincial Secretary of Ontario, 1877-89, Commissioner of Crown Lands, 1889-96, and Premier and Attorney General of the Province, 1896-99. He was born at Mount Pleasant, December 14, 1837, and died in Toronto, June 13, 1901. The tablet was unveiled by his son, Senator A. C. Hardy of Brockville on September 30, 1953.

John Wilson Bengough, Toronto, Ont.—A tablet was placed in the William Lyon Mackenzie Homestead, 82 Bond Street, to John Wilson Bengough, cartoonist, journalist, poet, and lecturer. He was the founder in 1873 and Editor to 1892 of the humorous

weekly "Grip". He was born in Toronto, April 5, 1851, and died there October 2, 1923. The tablet was unveiled under the auspices of the Homestead Trustees on November 6, 1953.

Peter McArthur, near Appin, Ont.—A tablet affixed to an iron standard was erected in a small road-side park adjacent to Highway No. 2, to Peter McArthur, journalist, poet, essayist, and author of "In Pastures Green" and other works. He was born March 10, 1866, on a farm near Appin, and died in London, October 28, 1924. The unveiling ceremony was held at the McArthur Homestead on October 24, 1953.

James Jerome Hill, Rockwood, Ont.—A tablet was affixed to the outer wall of the Township Office building to James Jerome Hill, pioneer railway promoter and builder in Canada and the United States. He was born on a farm near Rockwood, September 16, 1838, and died in St. Paul, Minn., U.S.A., May 29, 1916.

Dollier-Galinee Memorial Cross, Port Dover, Ont.—In 1922 the Department erected a monument in the form of a stone cross near the spot where in March, 1670, Dollier and Galinee erected a wooden cross with the Arms of France, claiming sovereignty over a large part of the Lake Erie region in the name of King Louis XIV. In view of the difficulty of access, the monument was dismantled in 1953, and with the co-operation of the Provincial Department of Highways, it was re-erected on a commanding site overlooking the town at the junction of Highway No. 6 and Brown Street.

De Champlain's Astrolabe, about three miles east of Cobden, Ont.—In 1951 the Department erected a cut-stone monument with tablet adjacent to Highway No. 17, to commemorate the finding in that vicinity of an astrolabe believed to have been lost by Samuel de Champlain about June 7, 1613, when on his exploratory expedition up the Ottawa River. A small bronze tablet showing the astrolabe in relief was affixed to the monument during the year.

James Bruce, Ottawa, Ont.—A brass plate was affixed to the base of the bust in the Lord Elgin Hotel of James Bruce, 8th Earl of Elgin, 12th Earl of Kincardine, K.T., G.C.B., Governor General of British North America, 1847-1854. The inscription on the plate records that the bust of James Bruce and that of his wife were presented in 1939 by their grandson, Edward James, 10th Earl of Elgin and 14th Earl of Kincardine, K.T., to the Canadian Government through the Right Hon. W. L. Mackenzie King, then Prime Minister of Canada.

Honourable Robert Baldwin, Toronto, Ontario.—A bronze tablet commemorating the Hon. Robert Baldwin, Joint Premier of Canada in 1848-1851 and founder of Ontario's municipal system, was placed under his portrait near the head of the main staircase of the Parliament Building in Toronto. It was unveiled in the presence of a large audience, including 30 descendants of Robert Baldwin, by the Premier of Ontario, Hon. Leslie Frost, and the Leader of the Opposition, Hon. Farquhar Oliver, on March 31, 1954.

Bishop George Exton Lloyd, Lloydminster, Sask.—A cairn with tablet was erected to Bishop George Exton Lloyd who, in 1903, led a party of more than 1,400 "Barr" colonists from the British Isles on an overland trek by horses and ox-drawn wagons from Saskatoon to the site of Lloydminster. At the end of their adventurous journey the colonists settled 56 townships in the district and founded the town of Lloydminster. Bishop Lloyd was Chaplain to the Queen's Own Rifles, 1885; Rector of Rothesay, N.B., 1890; Rector of Lloydminster, 1903-09; Principal of Emmanuel College, Saskatoon, 1909-16; and Bishop of Saskatchewan 1922-31. He was born in London, England, January 6, 1861, and died in Esquimalt, B.C., December 15, 1940. The monument was unveiled by the Hon. James G. Gardiner, Minister of Agriculture, during the Golden Jubilee celebrations of the town, July 19-21, 1953.

Peter Pond, near Prince Albert, Sask.—A cairn with tablet was erected on the north bank of the Saskatchewan River, about four miles west of Prince Albert, to mark the place where in 1776 Peter Pond, explorer and fur trader, built his first trading post. He was one of the founders of the North West Company and served with the Company until 1790. He was born in Milford, Conn., U.S.A., in 1740 and died there in 1807.

Viscount Richard Bedford Bennett, Calgary, Alta.—A cut-stone monument with tablet was erected in Central Memorial Park to Viscount Richard Bedford Bennett. The monument at Calgary was unveiled by the Hon. John James Bowlen, Lieutenant-Governor of Alberta, on August 16, 1953.

The Boat Encampment, Big Bend Highway, B.C.—A cairn with tablet was erected adjacent to the northern tip of the Big Bend Highway, about two miles west of the bridge crossing the Columbia River, to mark the site of the Boat Encampment, a point of transshipment in fur-trading days. Here boats from Fort Vancouver (now Vancouver, Washington), on the lower Columbia, waited for pack trains coming over the mountains from Jasper House. First visited by David Thompson in 1811, this point was for almost half a century a meeting place for the fur brigades of the North West Company and, later, of the Hudson's Bay Company. The monument was unveiled under the auspices of the Golden Board of Trade on September 6, 1953.

Wildlife Division

This Division deals with most wildlife matters coming within the jurisdiction of the Federal Government. Its functions include administration of the Migratory Birds Convention Act (in conjunction with the Royal Canadian Mounted Police and in co-operation with provincial game authorities); carrying on scientific research into wildlife problems in the Northwest Territories, Yukon Territory, and the National Parks of Canada; advising Northern Administration and Lands Branch and the National Parks and Historic Sites Division on wildlife management and co-operating in the application of such advice; and providing co-ordination and advice in connection with the administration of the Game Export Act by the provinces. It also deals with national and international problems relating to Canada's wildlife resources and co-operates with other agencies having similar interests and problems in Canada and elsewhere.

The Division staff included, during 1953-54, seven Dominion Wildlife Officers with districts as follows: Newfoundland, the Maritime Provinces, Quebec, Ontario, Manitoba and Saskatchewan, Alberta and the Territories, and British Columbia. Its organization provided for the employment of scientific research workers in the field as follows: a biologist with headquarters at Banff, Alberta, responsible for supervision of mammal investigations; a biologist in charge of caribou investigations with headquarters at Yellowknife, Northwest Territories; mammalogists with headquarters at Fort Smith, Aklavik, and Fort Simpson, Northwest Territories; at Churchill, Manitoba, and at Ottawa, for mammal investigations in the Northwest Territories; four wildlife management officers with headquarters at Vancouver, Saskatoon, Ottawa, and Sackville, for research into problems affecting migratory birds and other wildlife; and three limnologists, with headquarters at Ottawa, engaged in limnological research in the national parks and elsewhere. Headquarters of Wildlife Division officers in the field are shown on the map accompanying this report. Nine college and university students were employed as field assistants during the summer of 1953.

Migratory Birds Convention Act

This Act, as passed in 1917 and later amended, made effective the Migratory Birds Treaty signed in Washington, D.C., in 1916. It provides a measure of protection for numerous species of birds that migrate between Canada and the United States. The Federal and Provincial Governments co-operate in the administration of the Act, and Regulations in accordance with it are adopted annually by Federal Order in Council after agreement by those governments. Since 1932 the Royal Canadian Mounted Police have been responsible for enforcing the Migratory Birds Convention Act.

Migratory Bird Regulations adopted under the Act in 1953 were in some respects more liberal than in 1952. Maximum waterfowl seasons were extended to 60 days in the six eastern provinces, to 66 days in Manitoba, to 70 days in Saskatchewan and Alberta, and to 80 days in British Columbia; the actual increases varied from one to ten days. Daily bag limits for ducks were standardized at eight, except in Saskatchewan and Manitoba, where the limit was raised to ten; in Labrador and for residents in the Territories the daily limit remained at 25 ducks. All season bag limits were abolished. Possession limits, normally two days' bag limit, were raised to three days' bag limit in Manitoba and to four days' bag limit in Saskatchewan, Alberta, and British Columbia.

An important change in the Migratory Bird Regulations was made to provide more prompt and effective measures to combat damage by migratory birds to crops and other interests. That change conferred upon provincial and local game authorities the power (formerly restricted to this Department) to issue permits to scare or kill migratory birds causing or likely to cause serious damage.

Field Investigations

Mammal Studies

Investigations of game populations and distribution were continued in Banff, Jasper, Yoho, Kootenay, Waterton Lakes, Prince Albert, Point Pelee, and Riding Mountain National Parks, and included an aerial survey of Prince Albert National Park, a study of the elk of Riding Mountain National Park, an aerial census of muskrats in Point Pelee National Park and an investigation of wolf predation in Riding Mountain National Park.

Because of the existence of heavy populations of grazing mammals in the Rocky Mountain Parks, range studies were undertaken in several critical areas, including the Bow Valley of Banff National Park and the Athabasca and Brazeau Valleys of Jasper National Park. Post-mortem examinations were carried out on elk which were killed to reduce the excessive populations in these two parks.

Investigations of animal diseases formed an important part of the work in the parks in 1953-54. An outbreak of tularemia in beavers and muskrats was investigated in Waterton Lakes National Park. Wood ticks in Banff National Park were studied as vectors of animal-borne diseases. A beaver die-off in Prince Albert National Park was investigated.

Several long-term investigations dealing with big game animals in the Northwest Territories were continued to provide basic information for the management of these important sources of food. Aerial surveys of the barren-ground caribou in Mackenzie and Keewatin Districts and the northern Yukon were continued; fawning studies were conducted in the northern Yukon and in Mackenzie District; and summer-range studies were made north of Great Bear Lake. Aerial surveys of moose populations were carried out in the central Mackenzie District. The populations, diseases, and predators of buffalo in Wood Buffalo National Park were also investigated. Musk-oxen were studied in a new locality north of Great Bear Lake. Walrus and seal biology and utilization were studied near Southampton Island.

Studies of fur-bearers important in the northern economy were continued. Aerial surveys of beaver populations in the Mackenzie Delta Beaver Preserve and the Simpson-Wrigley district were undertaken. Twenty beavers were live-trapped and released on trapping areas. Continued muskrat studies in the Mackenzie Delta included the tagging and release of muskrats on trapping areas and experiments with habitat improvement through dam construction. Surveys of beaver habitats from Rae to Hottah Lake and a biological survey of the South Nahanni and Keele Rivers were undertaken. An experimental wolf-control program was initiated in a zone along the 60th parallel of latitude in co-operation with the Government of Saskatchewan.

Migratory Bird Studies

In 1953 officers of the Wildlife Division again co-operated with the United States Fish and Wildlife Service, provincial game branches and private agencies in conducting the annual survey of waterfowl populations, and breeding conditions. Information obtained from these surveys is used in establishing regulations for the hunting seasons.

In Newfoundland there was a substantial increase in black ducks, and other species of waterfowl increased slightly. In the Maritime Provinces numbers of black duck were greater than in 1952. Waterfowl breeding conditions in Ontario and Quebec were excellent, and surveys indicated slight increases in most species of waterfowl. In Manitoba there was little change in numbers of waterfowl, but drought in the southwestern portion of the Province caused a population shift to the north. Waterfowl populations in Saskatchewan and Alberta were the highest recorded in recent years, although breeding success, in some areas at least, was not high. In British Columbia there was also an increase in numbers of ducks.

The annual winter inventory of waterfowl indicated a decrease in numbers of birds wintering in Canada. The mid-winter survey of waterfowl in coastal British Columbia was expanded to obtain more precise data from the coastline of that province.

The annual survey of woodcock and Wilson's snipe was again carried out in Eastern Canada in co-operation with the Wildlife Management Institute, the Royal Canadian Mounted Police, provincial game officers, and other interested persons. Some progress was made in establishing uniformity of procedure in taking a census of these species. There was no significant change in numbers of Wilson's snipe and woodcock.

The following special investigations of migratory bird problems were made during 1953:

- Studies of damage caused by waterfowl and other migratory birds and of means of reducing such damage, with further investigation of sonic frightening devices;

- Studies of hunting pressure on waterfowl in several areas in Canada by means of bag checks conducted in co-operation with provincial game officers and the Royal Canadian Mounted Police;

- Investigation of waterfowl conditions, including hunting conditions, in the James Bay area in Ontario and Quebec;

- Investigations of the possible effects of proposed industrial projects upon the wildlife of the areas involved;

- Investigation of migratory bird conditions on the coast of Labrador, with emphasis on the location of murre colonies and the banding of murres;

- An aerial census of flocks of snow geese at Cap Tourmente, Quebec, and on the Fraser Delta, British Columbia;

- Special studies of the population, dynamics, and ecology of nesting waterfowl throughout Canada, most intensively in the Prairie Provinces, with further investigation of the use of colour-marking of birds to facilitate such studies;

- Investigation of methods of taking a census of Wilson's snipe in Newfoundland;

- Aerial counts of mergansers on the Miramichi River system, New Brunswick, in connection with an investigation of merganser-salmon relations in co-operation with the Department of Fisheries; and

- Study of the effect of a hail storm on waterfowl breeding success in Alberta.

Fisheries Studies

The three limnologists and one summer assistant conducted their investigations as follows:

The major activities were concerned with general surveys of lakes and streams in Yoho National Park in order to assess game fish populations and to adjust management policies, including fish plantings and regulations, to biological conditions.

Lakes and streams in Cape Breton Highlands National Park were investigated to determine the results of trout and salmon plantings carried out during current and preceding years, and to devise means for improving trout angling, which is poor in most of those waters.

A study of white perch, with particular reference to spawning habits, was conducted in Prince Edward Island National Park.

In Fundy National Park, the Point Wolfe River was examined for suitability of establishing a salmon population.

In the Prairie Provinces investigations were carried out on the spawning activities of pike in Mud Creek, Prince Albert National Park, and on the progress of the management program in Clear Lake, Riding Mountain National Park. Several other prairie park waters were also visited to secure additional data on lake trout, yellow walleye, and common whitefish populations.

In Banff Park, a poisoning operation, using rotenone, was carried out at the Warden Lakes, and a project for the management of the Spray River was investigated.

In all parks visited, local fisheries problems were discussed with park authorities and local organizations in order to promote interest in the creel census program and in the collection of biological information on all species of game fish.

Through the co-operation of hatchery personnel and visitors who angle in park waters, more than 10,000 completed creel census cards reporting angling activities during the 1953 season were received and analysed. The cards covered nearly 20,000 angling efforts reporting a total catch of more than 51,000 game fish. Results of the creel census were summarized in booklets, copies of which were distributed to persons who filled in creel census cards.

As usual, information and assistance were provided to the Banff, Jasper, and Waterton Lakes National Parks hatchery personnel in all phases of hatchery operation. Hatchery techniques for improving survival and growth of young fish and for lowering production cost have been reviewed, and specific experiments are being continued in this connection.

The limnologists assisted in the revision of the national parks angling regulations and participated in negotiations and discussions concerned with the Atlantic salmon research program, with the goldeye commercial fishery in Lake Claire, Wood Buffalo National Park, and with regard to the commercial netting operations for whitefish in Lake Waskesiu, Prince Albert National Park.

Migratory Bird Sanctuaries and Wardens

The Wildlife Division is responsible for the establishment and administration of migratory bird sanctuaries under the provisions of the Migratory Birds Convention Act. On March 31, 1954, there were 90 such sanctuaries, with a total area in excess of 1,800 square miles. A number of established sanctuaries no longer fulfil the purpose for which they were originally established, and other sanctuaries are no longer useful, owing to changed conditions. A survey of areas of doubtful value was commenced in 1953-54.

Sixteen important sanctuary areas were supervised by sanctuary caretakers. In addition, thirteen wardens were employed on breeding grounds in remote regions where special attention is required, such as the north shore of the Gulf of St. Lawrence and the breeding and wintering grounds of the rare trumpeter swan in Alberta and British Columbia.

Bird Banding

The scientific banding of wild birds in North America, which is conducted co-operatively by the Wildlife Division and the United States Fish and Wildlife Service, continues to progress favourably. Bird banding in Canada has been under Federal control since 1923, all banding being done by qualified banders who operate under authority of special permits.

As of December 31, 1953, the files of the Wildlife Division contained more than 808,000 records relating to birds banded and at least 72,266 records of recovered bands, including bands placed on birds in the United States and elsewhere and recovered in Canada. In view of their importance as game birds, special attention has been given to the banding of wild ducks and geese. During the summer and autumn of 1953, more than 25,000 ducks and nearly 9,000 geese were banded. Of the geese, more than 8,000 were blue and lesser snow geese banded on Southampton Island, N.W.T.

The investigation of the present status of the Brünnich's and Atlantic murre was continued in 1953, and considerable numbers of birds of these species were banded. Personnel of the Royal Canadian Mounted Police detachments, of Meteorological Stations of the Department of Transport, and of the Department of National Defence (Navy) have co-operated in murre banding on the breeding grounds of these birds on the islands of the Eastern Arctic.

Miscellaneous

The Chief of the Wildlife Division addressed the Annual Meeting of the Fish and Game Protective Association, Morrisburg, Ontario, in December, and the 19th North American Wildlife Conference at Chicago, in March. He also attended the Annual Meeting of the Greater Winnipeg Fish and Game Association at Winnipeg, in April; the Annual Convention of the International Association of Game, Fish and Conservation Commissioners at Milwaukee, in September; and the Annual Convention of the Quebec Federation of Fish and Game Associations at Montreal, in December. In November he acted as chairman of a meeting of federal and provincial officials at Winnipeg, called to discuss means of controlling an outbreak of disease among beaver in the Prairie Provinces.

The Assistant Chief assisted in the field studies and co-ordinated the data on woodcock and Wilson's snipe for eastern Canada. As a representative of the Division he attended and addressed the following international meetings: the National Waterfowl Council and the Waterfowl Advisory Committee to the Director, U.S. Fish and Wildlife Service, in Washington, D.C., in August; the 21st Annual Meeting of the Midwest Association of Fish and Game Commissioners at Dorset, Ont., in August; and a meeting of the Atlantic Flyway Council in Albany, N.Y., in November. He also addressed a number of public gatherings of clubs and other organizations in the interests of wildlife conservation.

Under the provisions of the Migratory Bird Regulations, 1,537 permits and licences were issued by the Wildlife Division. These comprised 404 permits for collection of birds for scientific purposes; 23 individual permits for disturbing or killing birds injuring agricultural or fishing interests; 13 permits for owners and occupants of land throughout specified areas to kill certain species of waterfowl found causing serious damage to crops; 14 permits for local control of the great black-backed gull by destruction of eggs and nests; 109 permits for local control of the herring gull by collection of its

eggs; 8 permits for taking migratory birds for propagation; 734 permits for possession of migratory birds for propagation; 165 bird-banding permits; and 67 taxidermists' licences.

Printed material distributed included: Migratory Birds Convention Act and Regulations, 9,500; Abstracts of Migratory Bird Regulations, 56,100; posters, 38,800; and educational and instructive pamphlets, 30,040.

National Museum of Canada

General Activities

The National Museum of Canada has three main functions: to collect and preserve for posterity Canadian anthropological and natural history material of scientific or economic interest; to conduct studies in connection with the material collected and related subjects; and to provide and disseminate information, both technical and general, regarding natural science and ethnology by means of exhibits, publications, lectures, photographs and other suitable ways.

Fifteen fulltime members of the Museum staff were in the field during the summer months and eight other workers carried out special investigations financed partly or wholly by National Museum funds. Zoological studies were made in Nova Scotia, New Brunswick, Quebec, Alberta, and British Columbia, and botanical investigations in Cape Breton Island, Quebec, Ontario, and Manitoba; archaeological work was carried out in Ontario, Manitoba, British Columbia, and the Northwest Territories; and ethnological studies, including the collection of folklore and folksongs, in Nova Scotia, New Brunswick, Quebec, Ontario, and the western provinces. A large amount of material for study and exhibition was secured and a great deal of new information gained. Other specimens were obtained by gift and purchase.

Four National Museum bulletins and several smaller publications were issued and work progressed on others. Numerous articles and reviews for scientific journals were written by members of the staff, including a complete Canadian number of the *Journal of American Folklore*. Material was loaned for exhibits in Canada and abroad, and information was distributed in the form of Museum publications, addresses, lectures, photographs, and by correspondence. Scientific specimens were loaned to other organizations and institutions, and other services rendered included the identification of material.

Exhibits were improved and new ones added. The Division of Entomology of the Department of Agriculture carried out renovation work on its exhibits of insects.

Three programs of Wednesday evening lectures for adults were prepared and proved very popular; on several occasions the auditorium could not seat all who wished to attend. Saturday morning lectures for children also drew large attendances, and on each occasion the program was given twice. In July and August a motion picture program entitled "Canada in Colour" was put on at three o'clock every afternoon from Monday to Friday for an hour for the benefit of visitors to Ottawa. The Macoun Field Club, consisting of three groups of boys and girls interested in natural history, had another successful year. Film strips illustrating the work of the Museum and the subjects in which it is particularly interested were planned as part of a continuing policy.

A new venture was initiated in August when a bronze plaque was erected by the Museum at Hogs Back, near Ottawa, to explain the interesting geology of this locality. This is the first attempt to mark a scientific site as such and it is felt that there are many places in Canada where such plaques would be of much interest to the local people and add a stimulating attraction for visitors.

The Annual Report of the National Museum for the fiscal year of 1953-54 contains a more detailed account of the Museum's activities.

Educational Service

Through its varied services the National Museum disseminates information on the natural history of Canada, and on the life and customs of the Indian and Eskimo. This is done by the use of visual aids, loans of special exhibits, motion pictures, film strips, specimens, publications, and correspondence. In addition there are exhibition hall tours, lectures and motion picture programs, and temporary exhibits.

National Museum Lectures

The adult lecture series given on Wednesday evenings is arranged to meet a wide variety of interests. The Lecture Committee in charge of arrangements reports a most successful season.

Adult Lectures

- Inside Russia*, by George Babcock Cressy, M.S., D.H.L., Ph.D., Syracuse, N.Y.
In the Shadow of the North Pole, by Ralph P. Hubbard, Jr., Denver, Colorado.
Land of the Incas, by His Excellency German Fernandez-Concha, Ambassador of Peru to Canada, Ottawa.
Steel for Canadians, by A. F. Mohri, B.Sc., Hamilton.
British Columbia—Our Sunset Province, by J. M. Humphrey, Vancouver.
Food for Asia, by H. L. Trueman, B.S.A., Ottawa.
Ungava—Land of Iron and Ice, by J. M. Harrison, M.A., Ph.D., Ottawa.
Kon-tiki—a motion picture.
Bristol; Ancient and Modern, by Gordon Bowen, M.A., Ottawa.
Canadian Expansion and the North, by J. Wreford Watson, M.A., Ph.D., Ottawa.
Burma—A New Democracy, by George T. Jackson, B.S.A., Ottawa.
Mediterranean Memories, by N. H. McRae, M.Sc., Ph.D., Ottawa.
The Conquest of Everest—a motion picture.
A Canadian in Australia, by John Convey, M.Sc., Ph.D., Ottawa.
Films from the Edinburgh Festival, with introduction by A. W. Trueman, B.A., M.A., (Oxon.), D.Litt., LL.D., Ottawa.

For the past 42 years illustrated lectures for school children from 7 to 12 years, have been given on Saturday mornings in the autumn and winter.

Children's Lectures

- The Lone Climber*—a motion picture.
Let's Visit Australia, by John Convey, M.Sc., Ph.D., Ottawa.
Frogs, Snakes and Toads, by Sherman Bleakney, M.Sc., Ottawa.
Ungava—Land of Iron and Ice, by J. M. Harrison, Ph.D., Ottawa.
The Boy Who Stopped Niagara. The Mysterious Poacher—motion pictures.
Let's Build an Organ, by Peter Harker, Ph.D., Ottawa.
Away Down North with the Eskimo, by Douglas Leechman, Ph.D., Ottawa.
Animals of the Canadian Seashore, by E. Bousfield, Ph.D., Ottawa.
Volcanoes in Action, by F. J. Alcock, Ph.D., Ottawa.
Musician in the Family. Summer is for Kids—motion pictures.
Nature's Songsters, by Earl Godfrey, B.Sc., Ottawa.
Children of other Lands—Pakistan—in co-operation with the Citizens Committee on Children, and the staff of the Pakistan High Commissioner's Office.

Group Visits

School groups from elementary and high schools visited the Museum in ever increasing numbers, as teachers have recognized more and more the value of Museum exhibits in supplementing school studies. Certain school groups came for regular study as part of the curriculum. While the greater number of students came from the Ottawa

area generally, groups arrived from Aylmer, Bowmanville, Blenheim, Denbigh, Espanola, East York, Gananoque, Hastings South and Prince Edward Co., Hudson Heights, Kingston, Owen Sound and Meaford, Parkhill, and from Lisbon, N.Y. Young adults from the United Kingdom, an international group from NATO, and a group of Latin American students attending Canadian schools, were given guided tours of the exhibition halls.

Lecture Hall

As in former years scientific and related organizations were granted the use of the lecture hall, when lectures on a variety of subjects were made available to the public. Among those who used the hall were Scientific Film Society, Geological Survey, National Film Board, Royal Astronomical Society, Canadian Geographical Society, Ottawa Fish and Game Association, Canadian Institute of Surveying and Photogrammetry and various diplomatic groups.

Photographs

Photographs from the Museum collections on subjects such as anthropology, biology, and palaeontology were supplied as illustrations for numerous publications and for use in schools.

Visual Aids

Visual aid material on anthropology, biology, palaeontology, and other phases of natural history was lent to other museums, and to teachers, and other interested persons in all parts of Canada. This material is lent free of charge except for payment of transportation charges one way.

Archaeology

Study of the routes of migration from the Old World through Alaska, the Yukon, and British Columbia was continued, with special emphasis on British Columbia. Archaeological sites were examined and specimens collected in the Kamloops, Cache Creek, Caribou, and Chilcotin areas. Work was also undertaken in the vicinity of Sicamous and the Arrow Lakes and a number of photographs of pictographs were taken, continuing the project already under way in 1951 and 1952. In the Kootenays a study was made of the succession of archaeological cultures and it seems probable, on the basis of information obtained, that the comparatively recent influx of the Kootenay Indians from the prairies displaced Shuswap people who had previously occupied that district. Two of the old underground baking pits, in which edible roots used to be cooked, were discovered and photographed. In the Creston area it was discovered that the Kootenay canoe, an unusual type of craft generally assumed to be extinct, was still in use. Three specimens were seen and photographed. On the east coast of Vancouver Island prehistoric Indian fish traps consisting of crescents of boulders laid on a gently sloping beach were photographed and examination was made of some of the numerous shell heaps scattered along the beach. One of these, about a third of a mile inland at Qualicum, is considered to be of considerable age.

Archaeological survey and excavations were undertaken in southern Manitoba. One hundred and thirty-three new Indian sites were discovered. Excavations occurred at two sites in the Whiteshell area, one at Lockport on the Red River, at an early Indian fort near Portage la Prairie, and two at Avery Lake in southwestern Manitoba. These archaeological investigations in conjunction with previous studies give a general outline of the histories of the Indians which the early explorers found in the prairies.

In Quebec, archaeological work was undertaken in the vicinity of Tadoussac where some new sites were found and other sites, already recorded, were re-examined. Red ochre burials in the Bruce Peninsula, Ontario, were examined and also skeletal material

from the Point Pelee area. More work was done on the Sheguiandah quarry site and a large number of specimens collected. Archaeological reconnaissance was undertaken in the London and Sarnia areas, in the Kingston area, and in the Ottawa Valley as far west as Mattawa.

Ethnology

Two projects, continued from previous years, were completed and the monographs relating to these studies are ready for publication. The first, *Littérature orale de la Gaspésie* deals with the systematic study of the folklore of Gaspé region; it takes into account all the facts of oral literature and aims at giving a picture as complete as possible of their distribution in this region. The other, *Analyse culturelle de Belle-Anse* is the result of two field-work seasons and embodies the cultural analysis of a Gaspesian village.

Many Indian reserves were visited with the object of recording traditional folk music. A total of 469 songs were recorded among Cree, Stoney, Assiniboine, Blackfoot, Kootenay, and Okanagan groups of Ontario, Saskatchewan, Alberta, and British Columbia.

As in previous years folklore was collected in Nova Scotia, New Brunswick, and in Beauce County, in Quebec. A large number of items were recorded on magnetic-tape recording machines.

Zoology

A survey was made of the summer birds of the Kootenay Valley, southeastern British Columbia, and studies were carried out of the coastal birds of southwestern British Columbia. An investigation of the mammals of Cape Breton Island was part of a general study of the mammalian faunas of the islands in the Gulf of St. Lawrence. Field studies and collections were made of the intertidal invertebrates of the St. Lawrence Estuary and the Gaspé Coast. A detailed investigation was made of the reptiles, amphibians, and fresh-water fishes of the Maritime Provinces and Gaspé Peninsula. Collecting of fossil vertebrates was resumed in the badlands of Red Deer River Valley, Alberta, with some success.

A report on the birds of Prince Edward Island was completed, as well as a short paper on the cattle egret of Newfoundland. A report on the birds of southern British Columbia is in preparation. A study of the barnacles of the Atlantic Coast of Canada was finished, together with a report on the invertebrates of the Mould Bay area, N.W.T. and two papers on hydrographic data. Studies completed on the lower vertebrates included range extension of amphibians in eastern Canada, food habits of lake trout of Squaw Lake, northern Quebec, and four records of the Atlantic Ridley turtle from Nova Scotia. A report on the amphibians of eastern Canada is in preparation. Palaeontological studies completed were descriptions of fossil mammals from the Kishenehn formation of southeastern British Columbia, a new eurypterid and cephalaspid from the Devonian of Gaspé, papers on the Upper Cretaceous and Tertiary formations of southwestern Saskatchewan, and a discussion of the early groups of Carnivora. Current projects are the description of new molluscs from the Kishenehn formation and of skeletons of fossil reptiles from the Cretaceous of Alberta.

Specimens were lent, information was provided, or other service rendered to the following organizations or institutions: Canadian Wildlife Service; Fisheries Research Board of Canada; Division of Entomology, Department of Agriculture; Defence Research Board; National Film Board; Geological Survey of Canada; Postage Stamp Division, Post Office Department; Canadian Museums Association; Arctic Institute of North America; Newfoundland Fisheries Research Station; Nova Scotia Museum of Science; Marine Biological Station, Grande Rivière, Que.; Collège de Ste. Anne de la Pocatière, Kamouraska, Que.; Department of Zoology and Redpath Museum, McGill University; Ottawa Field Naturalists' Club; Reuters News Agency, Ottawa; Ontario

Department of Lands and Forests; Royal Ontario Museum of Zoology and Palaeontology; Department of Zoology, University of Toronto; Departments of Zoology and Geology, University of Saskatchewan; Departments of Zoology and Geology, University of Alberta; Department of Zoology, University of British Columbia; United States National Museum; United States Fish and Wildlife Service; Museum of Comparative Zoology, Harvard University; Woods Hole Oceanographic Institution; American Museum of Natural History; Department of Geology, Princeton University; Department of Conservation, Cornell University; Department of Zoology, University of Michigan; Natural History Museum, Iowa State University; Minnesota Museum of Natural History; Department of Geology, University of Texas; Department of Geology, University of Wyoming; Departments of Zoology and Geology, University of Utah; Billings Geological Society, Billings, Montana; Arctic Health Research Center, Anchorage, Alaska; Life Magazine; Department of Zoology, University of Glasgow; Museum of Natural History, Reykjavik, Iceland.

Specimens of birds, reptiles, amphibians, invertebrates, and fossils were identified and placed in the collections. The insect exhibits were renovated and the liquid-preserved specimens of lower vertebrates were placed in better containers. Preparation work was done on the mollusc collection and on fossil vertebrates. A skull of a horned dinosaur was placed on exhibition.

The following specimens were added to the zoological collections during the fiscal year: approximately 261 lots of invertebrate animals; 425 fishes; 1,765 amphibians and reptiles; 939 birds; 565 mammals; approximately 25 determinable fossil vertebrates.

National Herbarium

Botanical investigations were conducted on Axel Heiberg Island, N.W.T.; Manitoba; Newfoundland, and the Clay Belt region of Ontario and Quebec. Large collections of plant specimens were made, including material for exchange with other botanical institutions, and numerous photographs together with other records supplied much valuable botanical information.

The specimens resulting from field work were studied and classified in the herbarium, together with collections submitted for report by various Government departments, or by individual botanists in the herbaria of Canadian or foreign universities. Three botanical papers were prepared for publication by members of the herbarium staff, and much progress was made with the preparation of four book-length reports dealing with the flora of different parts of Canada.

Specimens were studied or determined, botanical information or reports were prepared in response to inquiries from the following institutions: Wildlife Service, Editorial and Information Division, and Forest Research Division, Department of Northern Affairs and National Resources; Geographical Branch, Department of Mines and Technical Surveys; National Film Board; Secretary of State Department; Defence Research Laboratory, Ottawa and Manitoba; Science Service, Department of Agriculture; Brandon Experimental Farm; Forest Zoological Laboratory, Calgary; Acadia University, Nova Scotia; McGill University, Montreal; Macdonald College, Ste. Anne de Bellevue; Institut agricole d'Oka, La Trappe, Que.; Montreal Botanical Gardens; Arctic Institute of North America, Montreal, New York, and Woods Hole; Carleton College, Ottawa; University of Toronto; Royal Botanic Gardens, Hamilton; Manitoba Provincial Museum; University of Manitoba; University of British Columbia; University of West Virginia; Philadelphia Academy of Science; Emory University, Georgia; University of Colorado; Harvard University, Cambridge, Mass.; U.S. Department of Agriculture, Washington, D.C.; U.S. Forestry Service, Alaska; Norwegian Academy of Science, Trondheim, Norway; University of Helsingfors, Finland; University of Aberdeen, Scotland; University College of West Indies, Jamaica; Royal Botanical Gardens, Kew,

England; National Museum, Stockholm, Sweden; University of Copenhagen, Denmark; National Herbarium, Oslo, Norway. Similar services were rendered to numerous private individuals.

Three thousand, three hundred and ninety plant specimens were loaned to and 1,121 were borrowed from other botanical institutions for study; several thousand plant specimens received for identification were dealt with by the herbarium staff and 484 letters and memoranda were written; 4,092 herbarium specimens were received by exchange, 1,856 by donation, approximately 10,294 resulted from field work or were obtained in exchange for determination by the herbarium staff and 2,279 specimens were distributed in continuation of exchange. A total of 5,559 specimens were mounted and together with other accessions inserted in the herbarium, bringing the total number of mounted specimens of flowering plants and ferns in the National Collection to 226,687. This total will be materially increased when the reorganization of the collections of mosses, lichens, and algae has been completed.

Fifteen numbers were added to the file of botanical type specimens, now numbering 1,484.

Approximately 190 Canadian or foreign botanists visited the Herbarium for varying periods.

Branch Publications

Wildlife Division

Wildlife Management Bulletins

Series 1, Number 7: *The Mammals of Riding Mountain National Park, Manitoba*. J. Dewey Soper.

✓ Series 1, Number 8: *The Northwestern Muskrat of the Mackenzie Delta, Northwest Territories, 1947-48*. W. E. Stevens.

✓ Series 1, Number 9: *A Preliminary Study of the Musk-Oxen of Fosheim Peninsula, Ellesmere Island, N.W.T.* J. S. Tener.

Series 2, Number 6: *The Birds of Riding Mountain National Park, Manitoba, Canada*. J. Dewey Soper.

Reprint Papers

From Transactions of the Eighteenth North American Wildlife Conference:

Ducks and Grain. W. Winston Mair.

✓ *Aerial Surveys for Beaver in Mackenzie District, Northwest Territories*. William A. Fuller.

Underwater Television in Freshwater Fisheries Research. J.-P. Cuerrier, F. H. Schultz, and V. E. F. Solman.

From Canadian Field-Naturalist, October-December, 1953:

Notes on the Birds of Kluane Game Sanctuary, Yukon Territory, and Additions to the List of Banff National Park Birds. A. W. F. Banfield.

From *Forest and Outdoors*, March, 1953: *Television Goes Underwater*. V. E. F. Solman.

Technical Articles

White-tailed Deer *Odocoileus virginianus* in *Jasper National Park, Alberta*. A. W. F. Banfield.

Canadian Field-Naturalist, January-March, 1953.

The Range of Individual Timber Wolves (*Canis lupus*). A. W. F. Banfield. Journal of Mammalogy, August, 1953.

The Role of Ice in the Distribution of Mammals. A. W. F. Banfield. Journal of Mammalogy, February, 1954.

Annotated Catalogue of Insect and Other Invertebrate Pests of Tobacco in Canada. G. M. Stirrett. 83rd Annual Report of the Entomological Society of Ontario, 1952.

Miscellaneous

The Duck Problem (booklet).

Waterfowl Hunters' Guide (booklet).

Published jointly by the Wildlife Division and the U.S. Fish and Wildlife Service:
Investigations of Woodcock, Snipe, and Rails in 1953. Special Scientific Report, Wildlife No. 24.

Waterfowl Populations and Breeding Conditions, Summer, 1952. Special Scientific Report, Wildlife No. 21.

Analysis of Creel Census Cards Received from National Parks during the 1952 Angling Season. (Three pamphlets dealing separately with mountain, prairie, and eastern parks.)

National Museum

Bulletin No. 127, *Haida Myths* illustrated in Argillite Carvings, by Marius Barbeau, 417 pages, 328 illustrations.

Bulletin No. 128, *Report of the National Museum of Canada for the Fiscal Year 1951-52*, 286 pages, 41 plates and 14 figures.

Bulletin No. 129, *Catalogue of the Recent Mollusca of Canada, Biological Series No. 44*, by Aurèle La Rocque, 406 pages.

Bulletin No. 131, *List of Labrador Place Names*, by E. P. Wheeler, 2nd, 105 pages.
Rocks, Minerals and Fossils, Special Contribution 53—1 by Eugene Poitevin, honorary curator for Mineralogy, 15 pages.

National Museum of Canada, an illustrated guide, 16 pages.

Post cards in black and white and in colour illustrating National Museum subjects.

ENGINEERING AND WATER RESOURCES BRANCH

The Engineering and Water Resources Branch deals with projects related to the development of national resources, including joint Federal-Provincial projects and certain work connected with international water problems.

The Branch is divided into three Divisions:—The Administration Division, the Water Resources Division and the Engineering and Architectural Division. The functions and activities of these divisions are described in detail under the sections of this Report bearing their name. Field Officers are maintained in all provinces (except Prince Edward Island) and in the Yukon and Northwest Territories.

The Branch renders administrative and technical assistance, where required, to the Northwest Territories Power Commission. The Director of the Branch is a member of this Commission.

The Branch surveys the water resources of Canada and undertakes hydrometric investigations on behalf of or in conjunction with the governments of the provinces.

Engineering and architectural advice and services are provided to the various Branches of this Department, and to other Government departments and agencies upon request. The Federal interest in the joint construction of mining and development roads of national importance is represented by the Branch.

Water Resources Division

The primary function of the Division is the acquisition, analysis, and publication of stream-flow and run-off data covering the whole of Canada. These basic data are used in connection with power development, storage, irrigation, drainage, flood warnings, flood control, fisheries research, navigation, domestic water supply, and various international waterway problems. The Division acts as the central repository for hydrometric and water-power information acquired from all available sources. In the provinces, gauging stations are maintained and hydrometric investigations are carried out in accordance with co-operative arrangements under which provincial authorities contribute funds towards the cost of operation. In Yukon and Northwest Territories and on Federal lands, hydrometric operations and the administration of the Dominion Water Power Regulations are direct responsibilities of the Division. International waterway problems are of active concern and engineers of the Division serve on numerous boards and committees, act as technical advisers to the Department of External Affairs and to the International Joint Commission, and carry out special investigations and studies as required. Engineering assistance and advice are supplied to Federal Government agencies, particularly on hydraulic problems.

The Division's activities are largely co-ordinated with those of public and private organizations which are interested in the use of water resources. Close co-operation is maintained with federal, provincial, and municipal authorities with respect to water-power and water-supply problems, and special co-operative hydrometric investigations are undertaken to meet particular needs. Stream-flow data are furnished to many private companies, a large number of which reciprocate by supplying the Division with gauge records and with assistance in securing data of mutual interest. Cordial relations are maintained with the Water Resources Division of the United States Geological Survey in the operation of international gauging stations and in the exchange of run-off data. Current run-off data are supplied from each district office to a number of agencies to which they are of particular importance; accumulated data are issued later in printed volumes which are distributed from the head office.

In addition to its routine hydrometric operations, which were expanded during the year, the staff of the Division was called upon to carry out a large amount of special investigatory work, particularly in connection with the Columbia River, the international prairie rivers, the Niagara River, Lake Ontario, and the St. Lawrence River.

Hydrometric Service

For the purpose of facilitating hydrometric field operations, district offices are maintained in Vancouver, Calgary, Winnipeg, Ottawa, Montreal, and Halifax, with sub-offices in British Columbia at Kamloops, Nelson, Cranbrook, and Prince George; in Yukon at Whitehorse; in Ontario at Keewatin, Fort Frances, North Bay, and Niagara Falls; and in Newfoundland at St. John's. The location of each of these offices is shown on the map inserted inside the back cover of this report.

Stream Gauging

During the year, hydrometric field operations were maintained at a high level owing to the continuing demand for run-off data, particularly on international rivers, and 1,095 gauging stations were maintained, a considerable number of them continuously by the use of recording gauges. During the open-water season a maximum of 502 part-time observers were employed by the Division as gauge readers, and 354 of these served throughout the year; about an equal number of gauge readers, who also report to the Division, were paid by various co-operating agencies. A total of 4,072 stream-discharge measurements and 2,199 inspections of gauging stations were made by the technical field staff.

Field operations in British Columbia and the Yukon were directed from the district office in Vancouver, and sub-offices for hydrometric work were maintained at Kamloops, Nelson, Cranbrook, Prince George, and Whitehorse. A total of 365 gauging stations were in operation, of which 222 were all-year stations; 22 of these stations are located in Yukon Territory and one in the Northwest Territories. A program of improvement was carried out to gauging stations which were maintained under the regular hydrometric program. Close liaison was maintained with the British Columbia Water Rights Branch and the British Columbia Power Commission, and effective co-operation was given to the Quebec Metallurgical Industries Limited, British Columbia Electric Company Limited, the Aluminum Company of Canada, and the Bonneville Power Administration. Special hydrometric programs were carried out in connection with Columbia River investigations, Fraser River studies, and fisheries research. In meeting the demands of co-operative programs, river reconnaissances were carried out, discharge measurements were made, and new stations were established, particularly in the Fraser River basin and on rivers in Yukon Territory; at a number of these locations, cableways were constructed, gauge wells and shelters were built, and stage recorders were installed. A total of 1,176 discharge measurements were taken and 575 visits of inspection were made.

The Calgary district office maintained 227 gauging stations, of which 52 were in continuous operation and the remainder during the open-water season only; automatic water-stage recorders were used at 89 stations. Operations in Alberta were carried out under arrangements with the Provincial Water Resources and Irrigation Branch and with the Provincial Water Rights Branch. Seven stream-gauging stations in connection with power development and six water-level gauges for navigation purposes were located in the Northwest Territories. A considerable part of field operations was concerned with international prairie rivers on which 51 co-operative international and 22 semi-international gauging stations were maintained. Co-operative hydrometric programs were carried out on behalf of the Eastern Rockies Forest Conservation Board and the Prairie Provinces Water Board. Close co-operation was given also to the Prairie Farm Rehabilitation Administration in securing hydrometric data for irrigation

studies, to Calgary Power Limited on storage and power studies in the Bow River Basin, and to the Consolidated Mining and Smelting Company in water-power studies on the Taltson and Slave Rivers. Hydrometric operations involved 1,459 discharge measurements, 624 inspections of gauging stations, and slope-area determinations of flood discharges at eight stations. Maintenance and reconstruction involved the re-building of five gauge shelters, including a concrete structure on the Bow River, one new and four rebuilt cableways, and replacement of 12 staff or chain gauges by wire-weight installations.

The territory covered from the Winnipeg district office includes eastern Saskatchewan, Manitoba, and northwestern Ontario, throughout which 153 gauging stations are distributed, 97 being all-year stations. Operations in Manitoba are under an arrangement with the Manitoba Water Resources Branch. Regulation of the lakes in the Winnipeg River basin was continued, sub-offices being maintained at Keewatin and Fort Frances. Supervision was exercised over the Ogoki and Long Lac diversions by the Ontario Hydro-Electric Power Commission and new ratings were established for the Long Lake and Kenogami dams. A new station was established on the Neebing River near Fort William to assist in flood studies by the Ontario Department of Planning and Development. Special studies and hydrometric operations were carried out on international prairie rivers. One new station was established on Pine Creek to replace the former international station which became obsolete following diversion of flow to the Roseau River Game Refuge. With the co-operation of the Manitoba government and of interested mining and power companies, extensive hydrometric operations were continued in the drainage basins of the Churchill and Nelson Rivers; water-level recorders were maintained at one location on each of these rivers; northern transportation was provided by the Air Services of the Government of Manitoba for four trips each of about one week's duration. In March, 12 new stations were established on streams flowing into Lakes Dauphin and Winnipegosis to assist a provincial study of flood conditions in the area. Field operations included the making of 688 discharge measurements and 485 inspections.

Field operations in that portion of Ontario east of Long Lake and the Kenogami River, and in the western part of the Ottawa River basin in Quebec, are directed from the district office at Ottawa, sub-offices being maintained at North Bay and Niagara Falls. Hydrometric work included the maintenance of 154 gauging stations, of which 90 were primarily in the interest of power development, 53 for flood control and conservation studies, and the others were for various purposes. Fifteen new stations were established, 14 in co-operation with the Department of Planning and Development; seven stations were discontinued. During October, the discharge rating of the Great Lakes Power Company's plant at Scott Falls, Michipicoten River, was largely completed. During March, special attention was given to flood measurements in the Grand, Humber, Saugeen, and Thames River basins. A total of 312 discharge measurements and 411 station inspections were made. An intensive program of discharge measurement was carried out on the St. Lawrence River, involving 78 meterings of which 27 were made under ice conditions; special metering methods were used and the majority of the measurements were taken in duplicate or triplicate by running two or three meters simultaneously; this work was carried out in co-operation with the Hydro-Electric Power Commission of Ontario, the Department of Transport, and the United States Lake Survey. At the Niagara Falls office, studies were continued with respect to river slopes and discharge, and checking was continued of power diversions as required by the 1950 Treaty; substantial assistance was given to the International Niagara Falls Engineering Board and to the Niagara River Board of Control. Co-operation was given to the United States Lake Survey in winter measurements on the St. Clair River. Although operations in Ontario are principally under co-operative arrangements with the Ontario Hydro-Electric Power Commission, the Ontario Depart-

ment of Planning and Development, and the Grand River Conservation Commission, co-operation in matters of mutual interest also is maintained with a number of private agencies.

The Quebec District Office at Montreal is closely associated with the Quebec Streams Commission and co-operates in its investigations. Co-operation is also maintained with the power-producing agencies of the Province including the Quebec Hydro-Electric Commission, the Shawinigan Water and Power Company, the Aluminum Company of Canada, and the Gatineau Power Company. Four new gauging stations were established, making a total of 171 stations which were maintained, 119 being all-year discharge stations. The primary purpose of the majority of stations is in connection with waterpower development. On rivers flowing into Hudson Bay, observations of water level at certain stations were continued in co-operation with the Shawinigan Water and Power Company. Two winter measurements were made on the Bersimis River under difficult conditions. A new station was established and rated on the Wacoune River, a tributary of the Moisie River, in co-operation with the Iron Ore Company. Two gauges were maintained on the York River in connection with water-supply studies for the Gaspé Copper Mines Limited. Special work included the rating of the outflow of storage reservoirs and the checking of power-station discharge ratings. In all, 297 stream measurements and 60 visits of inspection to gauging stations were made. Considerable travelling was done in connection with the census of developed water powers in the province.

Hydrometric operations in the Atlantic provinces were directed from the district office at Halifax, a sub-office being maintained at St. John's, Newfoundland. In all, 33 gauging stations, in large part for power purposes, were maintained throughout the year and records on five other rivers were supplied by private agencies. In Nova Scotia, the work of maintaining 13 stations was carried out under an arrangement with the Nova Scotia Power Commission, co-operation also being received from several private power companies; new gauge shelters were built at three stations. In New Brunswick, under an arrangement with the New Brunswick Electric Power Commission, 10 stations were maintained; major repairs were made to the Grand Falls station on the Saint John River. In Newfoundland, organization of a hydrometric program proceeded satisfactorily under an arrangement with the Department of Natural Resources, ten stations being now in operation. In co-operation with Bowaters Limited, a series of measurements was made on the Upper Humber River. The construction of a gauge well and shelter on the Hamilton River in Labrador was completed in July and a recorder placed in operation. Field work included 140 stream gaugings and 44 inspections of stations.

Run-off Conditions in Canada

For Canada as a whole, while low-water conditions were experienced in British Columbia in April and in Quebec throughout the summer and autumn, total run-off for the year was well above normal, the average for 22 typical rivers distributed across the country being 130 per cent of the median flow of these rivers. Severe floods occurred on a number of small rivers in southern Saskatchewan and Alberta but none was of major proportions.

In British Columbia, the mean run-off of five typical rivers averaged 123 per cent of yearly normal. In the southern part of the province the discharges of the Fraser, Columbia, and Kootenay Rivers did not vary greatly from normal but high run-off was experienced during most months of the year in northern districts and on Vancouver Island. New high records were established for May and February mean flows and for February daily flow on the Skeena River, and for mean and daily November flows on the Sproat River.

Run-off from the eastern slope of the Rocky Mountains was moderately above normal for the greater part of the year, averaging 112 per cent for the two typical stations. Aside from rather high water on the North Saskatchewan River in June,

there were no extreme variations in flow. However, in the South Saskatchewan and Oldman River basins, extreme floods occurred in June with peak stages exceeding previous records. There was considerable damage to farms, bridges, and to the lower lying sections of the cities of Lethbridge, Medicine Hat, and Saskatoon, but not of catastrophic proportions.

Prairie run-off, as indicated by the Assiniboine River, was very high throughout most of the year, averaging 320 per cent of normal, with excessive flows being recorded consistently from July to March inclusive. New high records were established for August and February mean monthly and daily discharges and for September daily discharge. On the Red River average yearly run-off was 120 per cent of normal, with the higher conditions obtaining during the summer months. At the year's end Lakes Winnipeg, Winnipegosis, and Manitoba were respectively 1.5, 2.7, and 1.7 feet above mean elevation for the time of year. In more northern districts, the flow of the Saskatchewan River averaged about 110 per cent of normal, the Nelson 130 per cent, the Churchill 90 per cent, and the Hayes 110 per cent.

In northwestern Ontario, the discharge of the English River was normal in April and May but was excessive from May to March inclusive, the yearly average being 180 per cent of median. Mean monthly flows were record high in September, January, February, and March; also daily flows in February and March. Run-off to James Bay averaged about normal, although low river flows were experienced during the summer and autumn and a new low record for daily September flow was established. Similarly, yearly run-off to northern Lake Huron and Georgian Bay was close to normal, although a new low record for November discharge was established on the Aux Sables River. In southern and eastern Ontario, run-off averaged 146 per cent of the yearly median, the higher monthly river discharges being experienced during the summer and spring; a new high for February daily flow was recorded on the Saugeen River.

In Quebec, the yearly discharges of all four typical streams were below normal, averaging 80 per cent of median flow. Run-off conditions were particularly poor in the southern part of the province during the autumn although recovery was made during the winter. In the more central district, the discharge of the St. Maurice River averaged 75 per cent of normal and low records for mean monthly flow were established in June, August, and November; however recovery was made during the winter and, at the end of March, Gouin reservoir was above normal for the time of year. Although the discharge of the Harricanaw River was record high for April, sub-normal flows obtained from May to February inclusive and the August mean and daily flows were record low; average for the year was 81 per cent. More normal conditions were experienced on the eastern Outardes River and no extreme variations were recorded, although April was a month of high run-off and August was low.

In the Maritimes, general run-off tended to be below normal in spring and early summer but was quite high during winter months, so that the average was 155 per cent of normal for four typical streams. New low records were established on the Saint John River for monthly flows during August, September, and October, but flows for the December-March period were well above normal. In Newfoundland, long-term records are not available for comparison.

Flood-warning Service

As continuous records of river stage are obtained at strategic points on certain rivers which are subject to dangerous flooding, a flood-warning service is provided for these streams when required. On the Columbia and Fraser Rivers, river-stage forecasting is of particular value during the annual snow-melting period and, commencing May 1st each year, daily observations made at 19 key points are relayed to the Vancouver Office by telegraph. From these reports and from current meteorological data, a forecast of water levels for the following three days is released to the

public and has proved to be of great value. This service was maintained in May and June 1953 but no serious flooding occurred. Co-operation was maintained with United States authorities in connection with their forecasts of stages on the lower Columbia River during this period.

A similar service is given by the Calgary Office in forecasting stages on the North and South Saskatchewan Rivers. Co-operation is received from several agencies and predicted stages are supplied to Medicine Hat, Saskatoon, Prince Albert, and other downstream points. The necessary observations were made in May and June 1953 and the forecasts proved to be of great value, particularly to the City of Medicine Hat during the June floods in the South Saskatchewan basin.

The Winnipeg Office also forecasts stages on the Winnipeg River. Water-level observations were made available to interested parties but flood stages were not experienced during the year.

Current-Meter Rating and Experimental Station

A specially constructed and fully equipped station for the calibration of current meters and for the carrying out of tests and experiments in connection with stream-gauging apparatus is maintained at Calgary. Meters are rated for many organizations, as well as for the district offices of the Division, and much experimental work is carried out. The station operated from May 12 to October 14, and rated 128 meters for the Division and 27 for other agencies. A fully equipped work-shop is maintained and 81 meters were overhauled and repaired. In addition, seven water-stage recorders were completely stripped, repaired, tested, and put back into service. The concrete rating tank was lengthened by 100 feet and other reconstruction was carried out in the autumn of 1953.

Snow Surveys

For the purpose of estimating the amount of spring run-off which will result from the accumulated snow in certain important drainage basins, annual snow surveys are made on selected typical courses in these areas to determine the amount of water content in the snow cover; the monthly date of each individual survey is the same in each year but it varies according to the district location. The Calgary Office co-operates with the United States Geological Survey on snow surveys in the St. Mary River basin early in May each year and the 32nd survey, which was made in 1953, showed a snow cover about 138 per cent of normal. An independent survey in the Bow River basin is made late in March, and the 18th survey, which was made in 1954, showed the water content of the snow to be 159 per cent of the long-term mean. In the Cypress Hills, the second survey, which was made in March 1954, showed a mean water content of 1.50 inches. In the Winnipeg River watershed, the Division carried out surveys on three courses during January, February, and March, these being part of a co-operative program with the United States Corps of Engineers and the Hydro-Electric Power Commission of Ontario; the 1954 results showed a water content close to normal. In the northern section of central Ontario, six snow surveys, which form part of a co-operative program with the Hydro-Electric Power Commission of Ontario, were carried out in February and March, the water content of snow cover being about 67 per cent of normal. Regular snow surveys were made in New Brunswick in March, showing a water content varying from four inches in the Lepreau basin to 7.5 inches in the Campbellton area. In Nova Scotia, snow cover was light, the average of six courses showing one inch of water content.

The Water-Power Resources of Canada

From the stream-flow records acquired as a result of the Division's hydrometric investigations, and from all data accumulated from other sources, revisions are made from time to time in the estimates of the water-power resources of Canada. The

current estimate shows resources of 50,705,000 h.p. at ordinary six-months flow, which will allow of an economic installation of about 66,000,000 h.p.; on the basis of ordinary minimum flow, the estimate is 29,207,000 h.p. During 1953 new hydraulic installations totalled 638,012 h.p., bringing the installed capacity of all water-power plants in Canada to 14,929,074 h.p.; central-electric stations comprise 90 per cent of this total. New plants and extensions which are under active construction for operation in 1954 are tentatively rated at about 1,500,000 h.p., and others with a total capacity of approximately the same amount are under preliminary construction or are definitely planned. The current water-power situation in Canada was discussed in the Division's annual bulletin, *Water Power Resources of Canada*, issued under date of March 15, 1954.

Water Resources Monthly Review

Co-operation was continued with the United States Geological Survey in supplying data for the monthly summary of general stream-flow conditions in the United States and Canada, which is issued by the Survey. The flow records of 22 typical rivers, well distributed across Canada, are computed immediately at the month's end, each District Office providing data for the rivers in its territory; these data are transmitted by airmail to Washington where they are combined with those for the United States. The information in bulletin form is made available promptly to the general public and in some instances certain data are broadcast by radio; semi-annual and annual summaries also are issued. Supplementary to this bulletin, press releases covering conditions in Canada only were issued by the Division early in each month. The information is of great value in all matters concerned with current run-off.

International Waterway Problems

The Division provides membership on numerous International Boards which have been set up from time to time by the Governments of Canada and the United States, either directly or through the International Joint Commission, for the purpose of studying and reporting on a wide range of problems arising from the use and control of boundary waters and the administration of regulations pertaining thereto. For submission to the Commission, the Division participated in the preparation of thirteen annual reports from Boards of Control, and of five semi-annual, one interim, and one final report from Engineering Boards; also, as required, studies were made and advice was given on current problems. A summary of the Division's major activities in connection with these Boards is given hereunder:

Columbia River Engineering Board

This Board, of which the Chief of the Division is Chairman for Canada, continued its studies of the water resources of the Columbia River Basin towards development of the most advantageous comprehensive plan for their ultimate use. In Canada, much of the extensive field program required for this purpose has been directly supervised by the District Engineer at Vancouver, who is Chairman for Canada of the Engineering Committee assisting the Board.

To facilitate field operations of the Division, a sub-office was maintained at Revelstoke. Reconnaissance surveys of tributaries were extended on the Kettle River and were commenced on Eagle Pass, west of Revelstoke. Seismic investigations in connection with damsite locations were carried out on the Kootenay River near Copper Creek and on the Columbia River at locations near Pottlatch, Downie, and Sheppard Creeks. Sub-surface investigations by churn and diamond drilling were carried out at prospective damsites near Sheppard Creek, near Murphy Creek, and at the Mica Creek site, and were under way on the Duncan River near Marblehead. Progress was made on drilling to determine river-bed permeability at the Murphy

Creek and Genelle axes on the Columbia River, and at the Dorr site on the Kootenay River. Detailed topographic mapping was completed at the Murphy Creek and Sheppard Creek axes. Flowage appraisals were completed on the Similkameen River at the Bromley site and for flowage in Canada from the Shankers Bend site. Ground-water observations were continued at 137 wells on Kootenay Flats. The special hydro-metric program directly connected with the overall investigation was continued. The necessary field work was completed towards the determination of the water requirements for all arable land capable of irrigation in the Kootenay Valley between Canal Flats and the International Boundary.

Field operations by other agencies, which were co-ordinated by the District Engineer, contributed substantially to the progress of the investigation. The Geological Survey rendered assistance in sub-surface explorations, damsite examinations, seismograph interpretations, laboratory analysis of samples from drill holes and test pits, and ground-water studies. Surveys in the Flathead Valley were carried out during the summer by the Topographical Surveys Division. Six additional map sheets of the Columbia Basin were produced by the Legal Surveys and Aeronautical Charts Division, the forty sheets produced to date representing the completion of about 45 per cent of required coverage. The plotting of the hydrographic survey of the Columbia River between Arrowhead and Revelstoke was completed by the Department of Public Works, thus concluding this program. A report on materials available for construction at the Mica Creek site was completed by the Prairie Farm Rehabilitation Administration.

Osoyoos Lake Board of Control

This Board, of which the District Engineer at Vancouver is a member, continued its supervision of the water levels of Osoyoos Lake, which are partially controlled by operation of the Zosel Dam, located below the lake outlet on the Okanagan River at Oroville, Washington. Engineers of the Vancouver Office made periodic inspections of Osoyoos Lake and of downstream river conditions.

Kootenay Lake Board of Control

This Board, which has as its Canadian membership the two senior engineers in the District Office at Vancouver, continued its supervision of the operations of Corra Linn Dam. The level of Kootenay Lake was held within the prescribed limits during the entire period. Problems arising from the control and regulation were given further study. Attendance was provided at hearings by the Commission concerning damage claims from the effects of high water, which were filed with the Board by the Kootenai Valley Reclamation Association.

Waterton-Belly Rivers Engineering Board

Two of the Canadian members of this Board are provided by the Division. In accordance with the instructions issued by the International Joint Commission in 1950, unilateral studies of the problems of conservation and apportionment of the waters of these rivers were continued, substantial field and office assistance being received from the Calgary Office.

St. Mary and Milk Rivers

The Chief of the Division is the accredited officer representing Canada in the continued supervision of the division and use which is made of the waters of these rivers. The Calgary District Office handled the extensive field and office work required in the maintenance and operation of 38 international and 12 semi-international gauging stations which recorded the quantities of water stored, diverted, and used by each country.

Souris-Red Rivers Engineering Board

Two of the Division's engineers also serve on this Board. Progress was made on the preparation of a report outlining the water supply and requirements of the Souris River basin. An investigation was made by the Winnipeg Office covering the feasibility of diverting part of the flow of Mud Creek, a tributary of the Roseau River, via Reed River into Lake of the Woods.

Lake of the Woods Control Board

This Board, on which the Division holds membership, was established in 1926 under the authority of the Lake of the Woods Convention of 1925. Between elevations 1056 and 1061, the range established by the International Joint Commission, regulation is purely a Canadian responsibility but, when the lake level is above or below these prescribed limits, regulation becomes subject to the approval of the International Board. The International Board functioned from July 11th to August 12th inclusive, the lake being slightly above the upper limit during this period.

Rainy Lake Board of Control

This Board, on which the Division holds membership, is charged with the responsibility of regulating the levels and outflow of Rainy and Namakan Lakes, under the authority of the Rainy Lake Convention of 1938. The operation of the control works is carried out under the direction of the District Engineer at Winnipeg, a sub-office being maintained at Fort Frances.

Spring inflow was sub-normal, but that for the year averaged 115 per cent of normal with no extreme variations at any time. No water was wasted from Rainy Lake, but one or two sluices were open in the Kettle Falls dam at various times in maintaining Namakan Lake within prescribed levels. Regulated flow from Rainy Lake varied from an average of 5,280 second-feet for May to 17,400 second-feet for July. Lake level rose from 1105·46 feet on April 1st to a high of 1108·50 in July, which was reduced to 1104·68 at the end of March. The level of Namakan Lake varied from 1108·88 feet on April 1st to 1118·96 in September, and to 1104·68 at the year's end.

Lake Superior Board of Control

This Board, of which the Chief of the Division is member for Canada, supervised regulation of lake levels within the range established by the International Joint Commission.

Inflow to the lake did not vary greatly from normal and no difficulty was experienced in maintaining lake levels within prescribed limits. Seven gates were open during the greater part of the summer period and two during the winter months.

Niagara River Diversion Board

This Board, of which the Chief of the Division is member for Canada, continued to record the quantity of water used for power production and to determine the quantities available under the terms of the Treaty. Division engineers at the Niagara Falls sub-office inspected operations and records for the Board.

Niagara Falls Engineering Board

The Chief of the Division served as Chairman of the Canadian Section of this Board. The extensive studies and investigations with respect to the construction of remedial works at Niagara Falls, which were initiated in 1950, were completed during 1953. The final report was presented to the Commission in June and later was printed and distributed.

Niagara Board of Control

The Chief of the Division serves on this Board which was established in August 1953 to supervise the design and construction of remedial works at Niagara Falls, as successor to the Niagara Falls Engineering Board. The senior engineer from the Division's Niagara Falls office serves on the working committee. Plans and specifications for the submersible control gates for regulating the levels of the upper river were approved and a beginning has been made on preliminary construction.

Lake Ontario Board of Engineers

This Board, with representation from the Division, was established in April, 1953, for the purpose of studying the various factors influencing the levels of Lake Ontario, primarily in connection with the proposed regulation of the lake as will be required in conjunction with power development on the international reach of the Galop reach of the St. Lawrence River.

Inspections of the lake shoreline were made and attendance was provided at hearings of the Commission with respect to damage claims from high water. Studies on various phases of the problem have been pursued actively throughout the year. Prototype data were assembled towards the construction of a model of the Galops reach of the St. Lawrence River by the National Research Council.

**Co-Ordinating Committee on Great Lakes
Basic Hydraulic and Hydrologic Data**

The Sub-Committee on River Flow made substantial progress in co-relating data and obtaining agreement between Canadian and United States authorities with respect to the discharge of the St. Lawrence River. An intensive program of discharge measurements under winter conditions was carried out by the Division in co-operation with the Department of Transport, the Hydro-Electric Power Commission of Ontario and the United States Lake Survey. Studies of the results obtained have not been completed but it is anticipated that a re-computation of previously accepted winter discharges will be necessary.

Computation in connection with precise levels required by the Vertical Control Sub-Committee have been carried out but agreement has not been reached with respect to orthometric corrections. Extension of the level datum throughout the Great Lakes system will require much additional field work.

St. Lawrence River Board of Control

A representative of the Division holds membership on this Board and acts as chairman of the three-member Canadian section. The inaugural meeting was held on March 17th at Toronto, at which the terms of reference were discussed and initial arrangements were made towards the establishment of gauges on the international reach of the river to show changes in river levels during construction. An inspection was made of the model of the rapids as built by the Hydro-Electric Power Commission of Ontario.

Saint John River Engineering Board and Work Group

The interim report of the Board, together with its appendices, was completed and it was distributed on a restricted basis. The Board appeared before the Commission at Boston in January, at which time this report was discussed and additional later information was supplied. The 12th Progress Report was prepared for submission to the Commission.

Other Boards

Members of the Division staff also served on the following other Boards of Control, established to deal with international waterway problems: Columbia River (Grand Coulee Dam backwater), Souris River, Prairie Portage, Massena (diversion from St. Lawrence River), Lake Champlain, Lake Memphremagog, and St. Croix River; also the Engineering Boards for Sage Creek and for Passamaquoddy (tidal power).

Federal-Provincial Boards and Special Investigations**Dominion-Provincial Board—Fraser River Basin**

The District Engineer at Vancouver serves on this Board, which was set up in 1948 to study measures for the control and use of the water resources of the Fraser River basin. Several meetings of the Board and of its committees during the year were attended by representatives of the Vancouver Office.

In carrying out the co-operative hydrometric program with this Board, a stilling well and gauge shelter were built and recorder installed on the Murtle River near Clearwater, four cableways for metering purposes were constructed on Fraser tributaries, and on the Clearwater River a reconnaissance was made for two stations and miscellaneous discharge measurements were made.

Canada Water Conservation Act

Investigation of two projects, for which application for assistance under this Act was made by the Province of British Columbia, was carried out by the Vancouver Office. These involve the improvement of dykes and interior drainage in the Agassiz Dyking District at an estimated cost of \$122,000, and of the channelization and dyking of a reach of the Vedder River in the Sumas District at an estimated cost of \$488,000.

Bow River Control Board

Close surveillance was maintained by the Calgary Office over ice conditions on the Bow River near Calgary during the ice-forming period of 1953-54. A new recorder installation at Calgary was of valuable assistance in providing a continuous record of river stage.

As ex-officio member, the District Engineer at Calgary attended a meeting of the Board on February 9th.

Prairie Provinces Water Board

The Division supplies one of the two federal representatives on this Board, which was organized in 1948 to study the interprovincial waterway problems of the three Prairie Provinces. Meetings of the Board were held at Regina on October 10th and at Edmonton on March 18th.

Gauging stations, established at the request of the Board, were maintained throughout the year on rivers crossing the Alberta-Saskatchewan and the Saskatchewan-Manitoba borders.

Red River Basin Investigation

The report, together with its eight appendices, was completed, allowing the special staff to be disbanded at the end of June. The report was tabled in the House of Commons on November 27th and since then has been distributed on a restricted basis.

Canadian Lake of the Woods Control Board

Within the prescribed limiting elevations of 1,056 and 1,061 feet, lake regulation is under the jurisdiction of this Canadian Board, on which the Division holds membership. Operation of the control works was carried out under the direction of the District Engineer at Winnipeg, a sub-office being maintained at Keewatin, Ontario.

Inflow to Lake of the Woods was consistently normal or moderately sub-normal throughout the year and, except for a few days in late June, no water was wasted through the Norman dam. Monthly rates of regulated discharge varied from 7,020 second-feet in May to 15,100 second-feet in March. Lake level rose from 1058·70 feet on April 1st to 1061·13 on August 2nd and this was gradually reduced to 1059·28 at the end of March.

Supervision was exercised over the regulation of Lac Seul which was carried out by the Hydro-Electric Power Commission of Ontario. Spring run-off was below normal but at other periods was moderately high so that the yearly average was 122 per cent. Regulated monthly outflows varied from 4,110 second-feet in August to 9,090 second-feet in March. Lake level rose from 1165·26 feet on April 1st to 1171·49 on October 27th and this was gradually reduced to 1167·88 at the end of March.

Meetings of the Board were held on June 9th in Ottawa and on September 29th in Toronto.

Yukon River Diversion Investigation

In co-operation with Quebec Metallurgical Industries Limited, an extensive hydrometric program was carried out, involving the establishment of gauging stations equipped with recorders on the Yukon River near Hootalinqua and on the Big Salmon River; also a new staff-gauge station on the Taku River. Reconnaissances were made for stations and miscellaneous discharge measurements were secured on the Dezadeash, Teslin, Inklin, Kashawulsh, and Alsek Rivers.

Technical Assistance to Federal Agencies

The western district offices of the Division carry out important administrative and engineering functions on behalf of other federal agencies.

The Public Works Department received assistance in the major hydraulic problems involved in the development and maintenance of ship channels in the Fraser River and on other matters. The Division's Vancouver Office acted in British Columbia on behalf of the Dominion Lands Agent in the administration of federal lands. Co-operative hydrometric programs with the Pacific Biological Station, Fisheries Research Board of Canada, and the International Pacific Salmon Fisheries Commission were continued. Close co-operation in hydrometric matters was maintained by the Calgary District Office with the Department of Agriculture in its irrigation work in Alberta and Saskatchewan by the Prairie Farm Rehabilitation Administration, and with the Eastern Rockies Forest Conservation Board in its studies of run-off from the mountains. On behalf of the National Parks Branch, supervision was exercised over the flow of the Spray River from the Spray Lakes Reservoir, and of the Ghost River diversion to Lake Minnewanka. On behalf of the Industrial Waters Section, Department of Mines and Technical Surveys, water samples were secured from rivers in Manitoba.

Water-Power Administration

In connection with the administration of the Dominion Water Power Regulations, attention was given to the following developments:

Yukon Hydro Company Limited

Operating under final licence of March 18, 1952, the plant had a total output of 2,648,669 kw. hrs. during 1953 and rental received amounted to \$359.45.

An inspection of an addition to the plant was made on December 22nd and it was found to conform to approved plans. The overall capacity of the development now is 1,390 horse-power.

Lake Minnewanka-Cascade Development

This plant operates under final licence of May 14, 1947, and, as the total net power output during 1953 was 84,475,500 kw. hrs., rental in the amount of \$11,463.08 was received.

In connection with the regulation of Lake Minnewanka, daily water elevations were obtained; at the end of March, the lake elevation was 4814.40 feet, storage being well above average for the time of year. Stream gauging stations were operated to measure the Ghost River diversion to Lake Minnewanka.

Ghost Development—Bow River

Under the terms of the final licence for this development dated May 14, 1947, one-half of the annual rental is paid to the Government of Canada, through the Division, for the benefit of the Indians of the Stony Band. For the calendar year 1953, the total rental was computed as \$22,876.76. As an advance payment of \$3,500 had been made, a final amount of \$7,938.38 was received from Calgary Power Limited for transmittal to the Indian Affairs Branch, Department of Citizenship and Immigration.

Yellowknife River Plant

The plant of the Consolidated Mining and Smelting Company of Canada, Limited, on the Yellowknife River, Northwest Territories, operating under final licence dated December 24, 1942, had a power output of 25,872,200 kw. hrs. in the calendar year 1953, as compared with 26,060,800 kw. hrs. in 1952. The rental received for 1953 amounted to \$3,191.96.

Publications

Hydrometric and run-off data, as accumulated and tabulated, are published in *Water Resources Papers*, which are issued at irregular intervals according to convenience of printing. Each of these reports, giving data for two climatic years, covers one of the four drainage divisions into which Canada is divided for this purpose. The immediate distribution requires about 400 copies of each report.

The two regular annual water-power bulletins were issued and revisions of water-power articles were made for the *Canada 1953* handbook and for the *Canada Year Book, 1954*.

Revenue

The provinces contributed \$46,893.35 in support of co-operative water resources studies. Revenue secured from water-power licences amounted to \$15,763.06 and that from miscellaneous sources to \$5,295.35 making total actual revenue of approximately \$68,000.

In addition, \$85,699.48 was received from the Province of Manitoba for operating charges and for interest on federal capital investments in connection with the Lake of the Woods and Lac Seul storage, as provided in the Natural Resources Transfer Agreement.

Engineering and Architectural Division

This Division operates as a servicing unit to other branches of the Department and when requested to other Departments. It furnishes advisory or consultant and supervisory services and undertakes the complete execution of construction projects with funds provided by the branches being served. The Engineering and Architectural Division is comprised of a head office at Ottawa and district offices at Banff, Jasper, and Moncton. Resident Engineers are posted to the headquarters of each of the nine larger National Parks as Park Engineers. Similarly, engineers are posted at Fort Smith, N.W.T., and Whitehorse, Y.T., where they serve as territorial engineer in each case. The head office consists of an Architectural Section, an Engineering and Construction Section and an administrative and clerical unit.

Professional and technical personnel are normally engaged in field surveys, investigations, inspections, and professional supervision of construction projects; preparation of plans, bills of materials and estimates of costs of roads and bridges, as well as water, power and drainage systems; preparation of plans and specifications for the construction and repair of public and industrial buildings, schools, residences and other structures. Normal duties of Park and Territory Engineers involve responsibility for maintenance and minor construction.

National Parks Projects

National Historic Sites

Work was continued on repairs to the walls of the Quebec Citadel initially started in 1951. This included repointing and resetting.

Under an agreement with the Canadian Pacific Railway and the City of Quebec whereby the costs were to be divided, repair work on Dufferin Terrace in Quebec City was commenced. Foundation piers were repaired or rebuilt. The front guard rail and supporting coping was repaired and repainted and the deck kiosks were renovated and repainted. Further repairs are to be continued this year.

Work was commenced on improvements to the road leading from St. Denis Street to the Citadel in Quebec City. Paving of the road was completed and a sidewalk and retaining wall with guard rail will be installed this year.

Approximately 50 feet of the moat wall around Murney Tower in MacDonald Park, Kingston, Ontario, were renewed to restore the wall to a sound condition.

A stone retaining wall was erected for approximately 135 feet along Main Street in Gaspé, Quebec, fronting the Jacques Cartier historic site at that location.

Repairs were carried out to the plumbing, heating, and electrical systems and to the roof to restore the Martello Tower at St. John, N.B.

Renovations and repair work on the Halifax Citadel, begun in 1951, were continued. The cutstone facing of the rear wall of the Cavalier Building was rebuilt and stone facing was placed on the parapet walls and gable ends; all interior walls and brick ceilings were repaired and repointed; casemate floors at both ends of the building were replaced with new concrete floors towards provision of boiler and electrical rooms; all interior wooden floor structures were replaced; the rebuilding of chimneys was completed; the cutstone floor of the lower verandah was rebuilt; the colonnaded verandah and staircase structures at both ends of the building were renewed; new heating and electrical systems were installed; sash and doors were replaced. A 140-foot section of the escarp wall in front of the ball tower was rebuilt. Repair and remodelling of the interior walls and floors was undertaken in Casemates 13 and 14. The brick barrack block was demolished and replaced by a parking area. The new entrance road from Sackville Street was paved and sidewalks fronting Casemates 1 to 14 were laid. The front portion of Casemate 14 was rebuilt and converted to a restroom and new plumbing was installed. The cupola structure supporting the bells

in the old town clock was reinforced and braced. A new striking mechanism was constructed and will be installed in the current year. Electrical modifications and minor repairs were undertaken in the old powder magazine. The interior courtyard was landscaped and other minor repairs completed.

Cape Breton Highlands National Park

The reconstruction of sub-grade and the gravel surfacing of approximately 3 miles of the Cabot Trail Highway at a point 35 miles from the Ingonish entrance was carried out.

Prince Edward Island National Park

Seal-coating was applied to approximately 11 miles of the Dalway-Stanhope and Rustico-New London Bay Highways.

St. Lawrence Islands National Park

The stone filled cribbing of the wharf at Gordon Island was completely removed and in its place a new timber wharf and approach was constructed using rock filled cribs.

Point Pelee National Park

A new water supply and sewage disposal system and electrical services were installed at the camp-ground area. Seal-coating was applied to approximately six miles of the road within the park.

Riding Mountain National Park

Asphalt seal-coating was applied to No. 10 Highway and streets within Wasagaming Townsite for a total distance of approximately 35 miles. An asphalt-bound gravel base was laid on two miles of the diversion highway around the townsite.

Banff National Park

In Banff Townsite storm sewer mains were installed in Blocks 10 to 25 inclusive, sanitary sewer mains in Blocks 41 and 42, and water and sanitary sewer mains in Villa Block 4, and a sanitary sewer siphon was installed under the Bow River. A survey was conducted towards relocation of a section of the Banff-Jasper Highway from Mile 66.5 to 95.

Jasper National Park

The sub-grade was constructed and a gravel surface laid on 7.3 miles of the Banff-Jasper Highway from approximately Mile 48.7 from Jasper Townsite. The existing bridge structures were removed and reinforced concrete bridges were constructed over the Miette River at Mile 0.7 and over Grizzly Creek at Mile 52.3 from Jasper on the Banff-Jasper Highway. Between Mile 20.2 and Mile 48.7 from Jasper Townsite a seal-coating was applied. Work was commenced on removing bridge structures and replacing them by reinforced concrete bridges over the Villeneuve and Sulphur Creeks at Mile 7 and Mile 9.4 respectively on the Miette Hot Springs Road. This work, which was not quite completed, included new approaches for each bridge. A survey was made of extending the Medicine Lake Road to the north end of Maligne Lake. Improvements to the Jasper-Yellowhead Road, commenced in 1952, were completed.

Prince Albert National Park

A tower and steel water tank with a capacity of 104,000 gallons was erected at Waskesiu Townsite for the water supply and distribution system.

Kootenay National Park

Installation of a ventilation system in the Radium Hot Springs Aquacourt, commenced in 1952, was completed.

Yoho National Park

Construction of a 4200-foot section of the Yoho Valley Road, commenced in 1952, was completed.

Trans-Canada Highway Projects

Trans-Canada Highway construction within Banff and Yoho National Parks was continued as follows:

Sub-grade construction between Miles 0 and 4.2 from the east gate in Banff National Park westerly was completed. Construction of sections of road between Miles 4.2 and 10.8 were completed to the extent of about 90 per cent. A bridge was constructed over 40-Mile Creek. The Bow River Bridge and its approaches were completed. Construction of approximately 4 miles of road from the west gate in Yoho National Park easterly was completed to the extent of about 75 per cent. Road location surveys preparatory to construction of remaining sections of the road were continued in both Banff and Yoho National Parks. A bridge was constructed over the Kicking Horse River in Yoho National Park.

Northwest Territories and Yukon Projects

At Aklavik, a combination workshop and garage and a school principal's residence were completed and materials were stockpiled for an 8-apartment building and an 8-room day school. As these materials arrived on the site prior to the decision to move the town, construction was postponed. Other construction undertaken prior to this decision, however, included a warehouse for the teachers' apartment, a walk-in freezer, repairs to three canol freezers, and repairs to the 2-classroom school.

At Tuktoyaktuk an addition to the teachers' quarters was constructed, a generator and equipment for the school and teachers' residence were installed, and housing for the generator was constructed.

At Fort Simpson a residence and office building for use by the mammalogist and warden were constructed, as well as a combination warehouse and laboratory.

At Fort Smith three canol freezers were repaired.

Repairs to the warden's residence in Fort Good Hope were completed.

Maintenance of the Mackenzie Highway from the Alberta boundary through Hay River Settlement was again the responsibility of the Engineering and Architectural Division and was carried out throughout the course of the year.

A foundation and floor were installed for a group of Pan-American buildings at Whitehorse and three 2-car garages were constructed.

Agreements entered into with the Yukon Territorial Government were continued for:

- (a) All-year maintenance of the Mayo-Whitehorse Road on the basis of payment to the Territorial Government of 50 per cent of the cost.
- (b) Construction of an all-weather road between Stewart River Crossing to Dawson on the basis of the Federal Government contributing 60 per cent of the cost over a 3-year period to a maximum total of \$300,000.

Work was continued under the agreement entered into with the Keno Hill Mines Limited whereby the Federal Government contributes 50 per cent of the cost or a total of \$100,000, whichever is the lesser, for a resources road between Keno Village and the top of Keno Hill.

Non-Construction Services

In addition to the above construction projects, the Division furnished the usual advisory and consultant services on requests from other divisions and branches of the Department. These included the furnishing of designs and plans, cost estimates, bills of materials, and professional advice as to the most suitable arrangements for proposed construction still in the planning stages.

Branch Publications

Water Resources Division

Surface Water Supply of Canada

Water Resources Papers

No. 105—Arctic and Western Hudson Bay Drainage, 1947-48 and 1948-49

No. 106—Pacific Drainage, 1946-47 and 1947-48

No. 110—Pacific Drainage, 1948-49 and 1949-50

No. 112—Atlantic Drainage, 1950-51 and 1951-52

Water-Power Bulletins

“Hydro-Electric Progress in Canada”

✓ “Water-Power Resources of Canada”

(Mimeographed in English and French)

FORESTRY BRANCH

For the year 1952, the total drain on Canada's forests, including losses from forest fires, insects, and disease, amounted to 4.3 million cubic feet. Of this total 3.5 million cubic feet was cut for use—an amount almost twenty per cent greater than the average for the previous ten years.

Since the implementation of certain phases of the Canada Forestry Act in 1951, a number of functions, mainly of an administrative nature, have been added to the previous responsibilities of the Branch. After three years of operation, the agreements between the Federal Government and eight provincial governments in respect to forest inventory and reforestation are functioning on a satisfactory and co-operative basis. Seven provinces are receiving financial assistance from the Federal Government in the completion of their forest inventories; six provinces are receiving financial aid for reforestation. The area planted or seeded to date under reforestation agreements amounts to almost 37,000 acres and involved the planting of some 30 million trees. Under forest inventory agreements some two-thirds of the work has been completed in the provinces co-operating in this field.

An agreement with the Province of New Brunswick covering the experimental spraying to eliminate spruce budworm was signed in April, 1953, providing for federal financial assistance in the aerial spraying operation to eliminate the spruce budworm from the valuable pulpwood forests in the northern part of the province. One year of operation under this agreement has been completed. This far-reaching experiment which already has resulted in the spraying of some 2,800 square miles, will be continued for at least two more years. No final judgment may be given on the results of this work at present.

Under an arrangement between the Department of Northern Affairs and National Resources and the Department of National Defence the Forestry Branch became responsible, on January 1, 1954, for the protection and management of the forests on the Gagetown Military Area—a new function. Acquired for military manoeuvres, the Gagetown Area occupies some 430 square miles in the Province of New Brunswick.

In accordance with the Branch policy with respect to forest research, adopted last year, plans have been formulated which will ensure concentration of research upon problems of the most pressing importance. Projects in both fundamental and applied forest research were continued and expanded at the various forest experiment stations, and on other forested areas in co-operation with the provinces and forest industries. Good progress was made in developing methods of co-operation between various research agencies to eliminate duplication of effort and ensure the most effective use of available research facilities.

In the field of forest products research there has been a notable increase in the past few years in the extent to which the industry has become dependent on the Forest Products Laboratories of Canada for the solution of many of its industrial and technological problems. This, undoubtedly, is in large measure, the result of close collaboration between the Advisory Committee of Industry on Forest Products Research with the Forest Products Laboratories in the prosecution of both applied and fundamental research projects of mutual interest.

During the year, a study of the economic aspects of sustained yield was completed and published in a bulletin entitled *Economics of Forest Management*. New ground was broken, also, in the study of problems involving the valuation of forest lands.

Forest Economics Section

The Forest Economics Section provides information and advisory services pertaining to the Canadian forest economy. It maintains basic statistical tables on production, consumption, and exports and imports of forest products, and the latest available data on provincial forest inventories. Federal and provincial forest legislation is reviewed periodically.

An analysis of the Canadian forest economy in 1953 shows that it compared favourably with the previous year in quantity of production, although the value of the production was generally lower. Lumber production is estimated at an all-time record of 7,000 million board feet, but its value was somewhat lower than in 1952. The production of 5,770,000 tons of newsprint represents only a slight increase over the previous year's figure as the newsprint industry operated at capacity for the seventh consecutive year. Value of newsprint produced, however, is expected to show a considerable increase over the 1952 figure of \$600 million.

Forest products maintained their prominent place in Canada's external trade. They made up 32 per cent of the total value of Canadian exports to all countries, and yielded a favourable balance of trade of \$1,135 million, in contrast to a deficit of \$210 million in the balance of trade for all commodities (excluding gold).

The average annual rate of depletion of merchantable timber for the ten-year period 1942-51, in comparison with the estimated depletion for the year 1952, is given in the following table:

Annual Forest Depletion

	Millions of Cubic Feet of Usable Wood		Percentage of Depletion	
	Period 1942-51	1952*	Period 1942-51	1952*
Products Utilized				
Logs and Bolts	1,141	1,375	31.6	31.7
Pulpwood	940	1,199	26.0	27.7
Fuelwood	753	841	20.9	19.4
Other Products	101	130	2.8	3.0
Total	2,935	3,545	81.3	81.8
Wastage				
By Forest Fires	175	290	4.9	6.7
By Insects and Disease	500	500	13.8	11.5
Total	675	790	18.7	18.2
Grand Total	3,610	4,335	100.0	100.0

* Preliminary data.

Although all the utilization and most of the wastage occurs on the present *occupied productive* forest area of approximately 257,000 square miles (or where commercial cutting is concentrated), it is from the *accessible productive* forest of 578,000 square miles that the forest production of the future will be obtained. Merchantable timber on the accessible productive forest is estimated at 275,268 million cubic feet, of which approximately 125,000 million cubic feet may be considered as located on the occupied area. The average annual depletion for the decade 1942-51 amounts to 1.3 per cent of the *accessible* productive volume or to 2.9 per cent of the volume on the *occupied* forest land. The depletion for 1952, however, shows an appreciable increase over the average, being 1.6 per cent of the *accessible*, and 3.5 per cent of the *occupied*, forest. These rates indicate that whereas in many

localities severe over-cutting is taking place, the annual growth is not being used on the less accessible portions of the productive forest. This situation emphasizes the urgent need for increased protection and management of the commercial forests, if forest growth is to balance depletion and the forest industries are to maintain their favourable role in Canada's development.

The relative values of the different groups of forest industries are shown in the following summary of principal statistics for 1951:

Forest Industries
Summary of Principal Statistics, 1951

	Employees	Salaries and Wages	Net Value of Products	Gross Value of Products
	No.	\$	\$	\$
Woods Operations	158,113*	503,000,000	608,116,135	782,525,015
Pulp and Paper Industry	57,291	213,169,906	679,257,743	1,237,897,470
Lumber Industry	62,415	132,058,607	271,865,508	591,551,749
Wood-using Industries	68,864	151,003,467	257,412,502	561,825,023
Paper-using Industries	25,598	63,351,100	148,667,219	351,944,692
Total	372,281	1,062,583,080	1,965,319,107	

* Man-year basis (300 working days).

Net value of production is generally considered the most significant measure of the value of an industry in relation to the national output of wealth. In 1951, the forest industries, whose net value of production amounted to \$1,965 million, accounted for 15 per cent of the total net value of production of all Canadian industries, as compared to 11 per cent in 1938—the last full pre-war year—when the net value of the forest industries was \$310 million.

Among its other functions the Section sent out National Forest Inventory questionnaires to each provincial forest authority so that an up-to-date forest inventory for Canada could be compiled. Revised estimates for the Northwest Territories and the Yukon were also obtained from the Forest Inventories Section and used in the preparation of the annual leaflet *Canada's Forests*, and the *Amendments to Forest and Forest Products Statistics, Canada*.

The study of the costs of sustained yield forest management, carried out in co-operation with a pulp and paper company in Quebec, was completed and printed as Forestry Branch Bulletin 112, *Economics of Forest Management*. The bulletin will be sold through the Queen's Printer, Ottawa.

Studies have been made of certain problems associated with evaluating forest lands, particularly methods of valuation and the use of interest rates in calculating forest fire and other natural forest losses. A report was prepared on procedures for the valuation of forest lands in New Brunswick. Attention has also been given to the effects of taxation on logging in British Columbia.

Statistical reports on production and external trade in forest products were submitted quarterly and annually to the Economic Commission for Europe and to F.A.O. A forest inventory questionnaire for Canada was completed at the request of F.A.O. for inclusion in the Second World Forest Inventory.

A series of economic charts were prepared in connection with maps of the saw-mill industry and pulp and paper industry for inclusion in the Atlas of Canada, being prepared by the Geographical Branch of the Department of Mines and Technical Surveys.

The forestry chapter of *The Canada Year Book, 1954*, was revised and a special article written on *Administration of Crown Forests in Canada*. This article was also reproduced as a separate leaflet for distribution by the Forestry Branch.

Forest Research Division

The activities of the Forest Research Division are now being directed in accordance with a Forest Research Policy adopted in 1953. The work is conducted by three Head Office Sections, concerned respectively with Silviculture and Management, Forest Inventories Research, and Forest Fire Protection Research; five District Offices located at Calgary, Alberta; Winnipeg, Manitoba; Valcartier, Quebec; Fredericton, New Brunswick; St. John's, Newfoundland; and the Ontario Research Unit at Ottawa. All research projects undertaken up to the present have been reviewed in the light of a series of principal tasks defined in the policy statement, and each unit of the Division has defined the practical problems of greatest urgency within the area with which it is concerned. These decisions were reached in consultation with provincial forest authorities and industrial operators.

For each problem, five-year objectives have been set up, expressed either in terms of definite results to be achieved or amounts of research work to be accomplished within the period. Establishment of objectives was necessarily influenced by the size of the staff available in each area and by the special capabilities of the available research workers. In this way about 80 per cent of the working time of the staff is being directed towards specific goals. The remaining time was reserved to meet unforeseen requests for assistance and advice in research matters.

The planning procedures being followed are believed to be without precedent in forest research work, but they have already proved useful in giving better direction and guidance to the work of the Division as a whole. Precautions have been taken to avoid a degree of regimentation which would hamper full exercise of the initiative and imagination of research workers. On the other hand, the development of a research policy and suitable planning are expected to result in better use of the facilities at the disposal of the Division and in more rapid progress in securing information which will be of practical use to provincial forest administrators and to the forest industries.

During the year under review, the Tree Breeding Committee, which formerly operated as a subcommittee under the National Research Council, was re-established under the sponsorship of the Forestry Branch, and meetings under the new arrangement have been held in Ottawa.

At the request of the Advisory Committee on Scientific Policy, a study was undertaken of expenditures on forestry and forest products research by all agencies throughout Canada and a report was prepared.

The Chief of the Division served as a member of the Canadian delegation attending the Seventh Session of the Conference of the Food and Agriculture Organization of the United Nations held at Rome in November and December, 1953.

Silviculture and Management Section

This Section is concerned principally with the following tasks:

1. Development of a satisfactory system for classifying forests and forest sites.
2. Determination of the silvical characteristics of Canadian tree species, and the ecological relationships of the associations in which they occur.
3. Development of methods of silviculture which are applicable to the more important forest types and to Canadian economic conditions.
4. Development and testing of practical methods for determining the actual and potential growth and yield of forests.
5. Development of improved techniques of reforestation, and of improved strains of tree species suitable to Canadian conditions.

6. Improvement of methods of organizing forest data into plans of regulation and silviculture suitable to different intensities of forest management.

7. Improvement of research methods, mensuration techniques, and the design of experiments.

The significance of the tasks listed may be illustrated by reference to No. 3, regarding the development of methods of silviculture. The objectives of silviculture are to ensure the regeneration (or regrowth) of desirable tree species and to treat growing forests in such a fashion that they will produce the largest possible quantity of usable wood. To develop effective and economically feasible methods, suitable for Canadian conditions, a number of practical experiments have been undertaken in co-operation with forest industries, and experimentation on a smaller scale is being carried on at the forest experiment stations. The ultimate object is to obtain full benefit of the potential productivity of Canada's forest lands.

Many of the individual studies required in connection with each task are of a long-term continuing nature, though others permit of solutions within a short time. Much of the current work has involved a consolidation of research findings on a forest cover type basis. Results will appear in a series of comprehensive monographs, describing the known characteristics of the more important types with practical suggestions concerning their management.

The work of this Section is conducted through the various district offices and forest experiment stations. However, a small specialist staff at Ottawa conducts research in site classification, statistics and mensuration, and fundamental studies of an ecological nature. This staff provided field assistance in site classification studies undertaken in Alberta, Manitoba, and New Brunswick, and made considerable progress in improving experimental design and the analysis of experimental work throughout the Section. The experiment work in ecology is done at the Petawawa Forest Experiment Station.

Petawawa Forest Experiment Station

This 97-square mile area is being developed as the headquarters for Forestry Branch research in the fields of tree breeding, tree physiology, and fundamental ecological studies, and as a centre of demonstration for applied silviculture in the forest types common to central Ontario and Quebec.

In the tree breeding work, particular attention is focused on selecting and obtaining plant material for tests of red spruce and white spruce, and of red pine and jack pine, originating in different localities. A co-operative program with the Canadian Pulp and Paper Association was started which will assist materially in this work. Improved techniques for grafting in pine and spruce were developed, and flower inducing experiments in red pine were continued with particular emphasis on a study of osmotic pressure.

Increased staff permitted an expansion of ecological work, particularly with respect to the behaviour of tree species on different soil conditions. Radioactive rubidium 86 was used to trace the movement of materials within mature trees of various species throughout different seasons of the year. Experiments concerned with the growth of seedlings at various soil moisture levels, light intensities, temperatures, and relative evapotranspiration levels were continued and expanded under both nursery and forest conditions. A technique developed for growing seedlings in test tubes under controlled conditions, to observe the growth and behaviour of the roots, appears very promising.

Experimental work in applied silviculture included group shelterwood cuttings in the red pine and white pine cover type, and further tests of chemicals for the control of undesirable tree species and competing vegetation. A number of the red pine plantations were thinned. A preliminary survey was made of a 5,000-acre area

adjacent to station headquarters with a view to utilizing it for demonstrations of intensive silviculture. The cutting of timber under the station management plan was curtailed because of military operations.

Newfoundland

During the year, emphasis shifted from the fact-finding projects which were a necessary initial basis for research in this district, to more specific experimental work in both coastal forest areas and the major pulpwood producing sections of the province.

Field work was completed for a comprehensive study of the forestry problems in the Avalon Peninsula, and for studies of regeneration on burned-over areas. Publications on these projects are being prepared.

A major portion of the 1953 field work was concerned with selecting areas suitable for large-scale cutting experiments which will be started in 1954 in close co-operation with the two major pulp and paper companies on the island. The objective is to develop methods which will ensure the regeneration of cut-over lands to desirable species.

Reforestation research on various classes of non-forested land continued. Direct seeding with black spruce and balsam fir on the Cormac and Hampden "burns" shows promise of success. Small-scale seeding and planting studies were also extended in eastern coastal areas.

Other operations were as follows: field work was completed and a tentative management plan prepared, in co-operation with the Province, for a community forest near Deep Bight; a series of transect sample plots were established in cut-over stands where white birch is being removed for veneer, so as to study the effect of the operation on stand development; preliminary phenological observations were started at six locations.

Maritime Provinces

The silviculture of spruce and fir is the major field of research in this district. A publication summarizing available information on this topic is the immediate objective and much of the work in the past year was related to its attainment.

A three months' reconnaissance was made of the forests of Nova Scotia preparatory to devising a general forest classification for the Maritimes. This was a continuation of work started the previous year in New Brunswick, and is a necessary basis for the proposed monograph and future studies in site classification.

Regeneration received considerable attention. At the Acadia station this included the preparation of a comprehensive report on several years' study of natural seed-beds on the regeneration of spruce and fir, a study of the seed dissemination of spruce and fir, and the use of fire to influence the composition of regeneration after cutting. On the Green River Management Area studies were made of the regeneration on cut-over lands and of the effect of different types of logging and slash on reproduction.

In the silviculture of immature spruce and fir, an investigation of the origin and structure of the dense lower story in two-storied stands was concluded. As a follow-up to this work, a thinning experiment was established to determine the effects of various degrees of release on different sizes of stems in thickets. At the Acadia Forest Experiment Station old thinning experiments were remeasured and regular seasonal cuttings were made in two managed woodlots.

A large number of tolerant hardwood stands in Nova Scotia were examined as a basis for a publication which will describe their condition and recommend management practices for them. Forest management studies included the preparation of a management plan for the Sheet Harbour Forest Management Area in Nova Scotia which will be operated by the Province, and the maintenance of eleven managed woodlots throughout the Maritimes.

A long-term research program in tree breeding to develop superior spruce and fir for reforestation purposes in the Maritimes was started, in close co-operation with the tree breeding program at Petawawa. Seed of different origins is being assembled at the Acadia Station for provenance experiments and for studies of the progeny of apparently outstanding trees. Special attention is being given to the problem of differentiating between red spruce and black spruce, and to identifying trees of high resistance to budworm damage.

Quebec

Site classification of the Boreal forest continued to occupy a considerable part of the research program in Quebec. A comprehensive report describing the sites has been prepared for publication and sampling was continued to obtain data for normal yield tables applicable to the different sites. The amino acid content of plants and soils occurring in different site quality classes was studied in co-operation with Laval University, so as to obtain information on the influence of these acids upon the accumulation of organic matter and tree growth. Further work was done on the soil requirements of white spruce in the Great Lakes—St. Lawrence Forest Region, particularly on old pasture land.

Three more observation areas, each sampled by two to three hundred semi-permanent line plots, were established to study regeneration and growth after logging and fire. Two of the areas were in the relatively slow-growing black spruce types found at the headwaters of the Harricanaw and Bell Rivers in the northwestern part of the Province. The third area was north of Montreal at the head of the Ouareau River, where the virgin forest containing red spruce more than 350 years old has recently been opened for logging.

At the Lake Edward Experiment Area, north of Grand'Mère, where the forest has been under continuous observation for thirty years, diameter limit cutting of pulpwood and hardwood sawlogs continued. A report on the development of this area is being prepared. On the Lake Kenogami experimental cutting area, line plots were remeasured and the timber marked for a second large-scale cutting experiment to take place in 1954-55.

On the Valcartier Forest Experiment Station, and adjacent military reserve, orderly cutting under the management plan continued to remove overmature and defective timber. Almost all of the area has now been covered by this type of operation and is in good silvicultural condition. Small-scale nursery and planting operations continued on the area.

Ontario

The preparation of a monograph on the red pine and white pine cover type in Ontario and Quebec was continued by studies of regeneration, growth, and site conditions in northwestern Ontario, Temagami, and central Ontario districts. Site groupings, based on broad land type divisions and the Hills system of site classification, appear to be a suitable framework for the growth, stand development, and regeneration aspects of the study.

A harvest cutting and seed-bed experiment to improve the stocking of yellow birch in tolerant hardwood stands was established in the Haliburton district. The co-operating company logged the stand and scarified 25 acres of the cut-over area with a bulldozer blade, in accordance with the research plan. Field observations and analysis continued for the preparation of a monograph on the yellow birch-hard maple type. This work is particularly important because of the rapid decline in the supply of yellow birch available to the veneer and lumber industries.

Active co-operation was continued with a number of pulp and paper companies who are establishing many growth and yield plots in the Boreal forest. The Forestry Branch acts as a co-ordinating agency to avoid duplication of effort and also provides instruction on techniques and on site identification.

An inventory survey and an ecological study of the experimental area at Heron Bay were made as the Forestry Branch contribution to this large-scale co-operative cutting experiment. It is designed to develop silvicultural techniques for the successful regeneration of mixedwood slope types in northern Ontario.

Reforestation research was concerned with a spacing experiment in red pine on 66 acres of abandoned farm land near Chalk River, using spacings of from 4 to 14 feet. Also, in co-operation with the Canadian Pulp and Paper Association, a preliminary survey, on a questionnaire basis, was made of 24,000 acres of plantations established since 1916 by member companies, who are now planting a combined 4,700 acres per year.

Management studies were confined to summarizing relevant legislation.

Manitoba-Saskatchewan

Studies on the silviculture and management of the spruce-aspen type continued to occupy the major portion of the research effort, although considerable work was also done with the jack pine type, the black spruce type, and others.

For the white spruce-aspen type, information collected during the year was combined with that previously obtained in preparation for the publication of a monograph. A harvest cutting experiment was started at the Riding Mountain Research Area, using 10-acre compartments as the treatment units; ground scarification will be done when a seed year occurs for white spruce. Studies designed to assess the influence of the aspen overstory on white spruce development were completed in Saskatchewan. Existing sample plot studies on the growth and yield of spruce in both thinned and unthinned stands were remeasured. Work continued on the establishment and survival of white spruce seedlings under various conditions; the development of planted seedlings was studied in relation to age of stock, season, site, spacing, and the removal of competing underbrush by the use of herbicides.

Several investigations, chiefly at the Sandilands Forest Reserve, dealt with the relation of jack pine regeneration to the system of logging, slash disposal, and seed-bed preparation by scarification. Thirty acres were cut by different methods and the ground scarified to induce regeneration. Observations were continued on jack pine thinning studies and on plots established to follow development under different density conditions.

Following an examination of numerous cut-over and undisturbed black spruce stands in the area east of Lake Winnipeg, it appears evident that future research with this type should be concentrated on the upland sites, where regeneration following cutting is generally unsatisfactory. The establishment of a harvest cutting experiment in the black spruce type was completed in the Sandilands area.

A beginning was made on a forest site classification on the Riding Mountain Research Area; fifteen square miles were examined, and the main soil associations mapped. Other studies included the preparation of a report on plantations established in the Spruce Woods Forest Reserve, between 1906 and 1930, and the remeasurement of a thinning experiment in young aspen at the Turtle Mountain Forest Reserve.

Alberta

Forest research in this district is being carried out in both the Boreal and Subalpine Forest Regions and is confined to the silviculture and management of white spruce, lodgepole pine, and aspen—the most important tree species in Alberta.

Investigations and studies to determine suitable silvicultural techniques for regenerating lodgepole pine and white spruce following fire and cutting received considerable attention, and included scarification studies, partial and harvest cutting experiments, seed dispersal studies, generalized quantitative regeneration surveys, and ecological observations of reproduction following fire.

Research in the growth and yield of uncut and cut-over spruce, lodgepole pine, and spruce-poplar stands is being continued. Work undertaken included construction of standard volume tables for lodgepole pine, preparation of base yield curves and preliminary yield tables for lodgepole pine in the Foothills Section of the Boreal Forest Region, a survey to assess the effect of partial cutting on growth in even-aged lodgepole pine stands, a survey to assess the growth and yield of residual stands of white spruce in logged areas of the Boreal Forest Region, and the re-examination of an experimental cutting area of white spruce in a mixedwood stand in northern Alberta.

Fundamental studies to determine the successional relationships in the lodgepole pine associations and the specific silvical characteristics underlying these relationships were started and will continue next year. These include a study in the succession of lodgepole pine after fire, seasonal diameter growth of lodgepole pine, and phenological studies.

The problem of site received considerable attention and studies are under way to derive a practical method of site evaluation for the mixedwood stands of northern Alberta, the foothills, and the Subalpine Forest Region.

Reforestation studies have been confined to the Kananaskis Forest Experiment Station and problems being investigated include studies of direct seeding and seed-spotting as a means of forest reproduction on mountain lithosols, and seasonal planting comparisons in white spruce.

Various methods of thinning lodgepole pine have been undertaken and are being currently studied to devise practical means of stimulating diameter and height growth in dense stagnated stands. A monograph on lodgepole pine containing all available information pertinent to the management of this species is being prepared.

Forest Inventories Section

Forest inventory techniques have been subject to radical changes in recent years because of advances in air photography and various other developments which have provided a fertile field for research. Work done in the fulfilment of departmental requirements for forest inventories has served to indicate problems requiring solution and has provided opportunities for the development and demonstration of new techniques.

Forest Inventory Research

Stand volume tables are being prepared primarily to provide basic information for use by the air photo interpreter in estimating the volumes of stands. They may be employed as the sole basis for general estimates of timber quantities when more specific field data are not immediately available. For use in various forest conditions, these tables are based on the average height of the trees and their canopy density, subdivided in accordance with the ratio of canopy density to basal area per acre.

A total of 266 sample plots were measured to supply data for stand volume tables, chiefly by field parties in the Lièvre and St. Maurice drainage areas in the Province of Quebec. Data were compiled for each plot and a code of individual plot records was transferred to punched sorting cards to facilitate analysis.

Tables showing the ratio of canopy density to basal area per acre were prepared, using data from 120 sample plots measured during 1951 in an area near Nipigon, Ontario. These ratio tables will make it possible to use canopy density, as estimated by the photo interpreter, to estimate basal area which in turn can be used in estimation of timber volumes. The possibilities of using these estimates of basal area, in conjunction with aerial estimates of heights and site conditions to predict future yields, are being investigated.

A comparison of various inventory sampling methods was commenced on an area near Lanark, Ontario, in which the random method of sampling will serve as the basis for comparison. Forest type maps covering this area, which comprises 145 square miles, were prepared from air photographs. Some 27 sample plots selected at random, were measured in one of the forest classes and statistical calculations based on the results of this very limited initial work indicated that the degree of accuracy obtainable is much greater than was expected.

Eight diagrams illustrating the relation between heights of individual trees in the stand and their average heights weighted by volume were brought to an advanced stage. These diagrams are intended for use as standards by the air photo interpreter, who estimates the average height weighted by volume, of the trees, in preference to the unweighted average height of the dominant and co-dominant trees. The former is based entirely on measurement and calculation, whereas the latter is subject to personal judgment in distinguishing the co-dominants from the intermediate trees.

Delicate balances were used in a test of a method for determining map areas by weighing map segments. No pronounced advantage over other methods was found except when a single forest class was composed of a number of segments, for which a single weighing operation was sufficient. Incidentally, it has been found that map segments may generally be cut out more rapidly by an electrically operated chisel than by ordinary scissors.

The Section continued to supply information for use by the Operations Division regarding various technical problems encountered in the operation of the Canada Forestry Act.

An article entitled, *A Forest Survey Method* was written with a view to distribution as a forest research publication.

Yukon Inventory

Air photo interpretation and forest mapping required for the inventory of the forest resources of the Yukon Territory were done by the staff of this Section assisted by two foresters of the Operations Division. The Northern Administration and Lands Branch supplied assistants and equipment for the field work, and the Forestry Branch provided chiefs of party from the Operations Division and Inventories Section. The inventory is being carried out in accordance with a method of survey developed by the Section.

Provisional forest maps prepared covered a total area of 4,320 square miles. The field party employed these maps to the extent of some 2,780 square miles, together with similar maps prepared in the previous year covering 1,730 square miles. Some 621 sample plots were measured, mainly in the southern part of the Yukon Territory. Mosaics and base maps of 1,950 square miles in the southeastern Yukon were prepared and used in the compilation of provisional forest maps covering an area of 1,540 square miles to be sampled by a field party during 1954.

Computation and tabulation of the sample plot data were performed in a most economical manner by the Dominion Bureau of Statistics, employing punched cards and the appropriate machines. A procedure was developed in co-operation with the machine manufacturers and the Bureau to meet the requirements of the Section, which provided the raw data in suitable form. The design of the punched cards is sufficiently comprehensive to permit their adoption in various other inventory surveys.

Many forest maps were revised by the aid of the field data, and those forest maps covering 1,300 square miles in the McQuesten River area were revised by the aid of air photographs taken in 1953, at a suitably large scale especially for forestry purposes.

Mosaics and base maps were also completed of an area of 2,500 square miles in extent in the vicinity of the junction of the Yukon and Teslin Rivers. This area lies within a region which would be flooded by a proposed hydro-electric development and the base maps will make possible the preparation of forest maps and estimates of potential timber damage.

Tentative estimates of timber quantities existing in the Northwest Territories and the Yukon, based on information available at the present stage of inventory, were compiled for the Economics Section for use in preparing forest statistics.

Other Inventories

Forest maps covering the 76 square miles of the Federal Government Coal Lands, East Kootenay District, British Columbia, were prepared. Preliminary estimates of standing timber were compiled for the Northern Administration and Lands Branch.

The Doncaster and Maniwaki Indian Reserves, in Quebec, totalling some 90 square miles, were covered by provisional forest maps for use in field work by the Indian Affairs Branch, Department of Citizenship and Immigration.

Provisional forest maps covering the 3,720 square miles of the Avalon Peninsula, Newfoundland, were revised with the aid of field data. These data were compared with the estimates of the height and density of the timber made by the air photo interpreters and a satisfactorily close correspondence was found.

Fire Protection Section

Many of the major problems in forest fire research studied by the Fire Protection Section are related directly, or indirectly, to fire control planning. Most investigations are made at the request of provincial and other forest protection agencies which often co-operate in the undertakings. All members of the staff are employed in Ottawa but most of the technical officers spend about one-half of each year in the field at forest experiment stations or at temporary fire research stations especially established for studying conditions in specific localities. The necessity of engaging in forest fire research is readily apparent from a perusal of the forest fire loss statistics noted hereunder.

Forest Fire Losses

Excluding the Yukon and Northwest, for which long-term records are not available, there were some 6,440 forest fires in Canada during 1953. This number represents an increase of more than 25 per cent over the average for the preceding 10 years. The total area burned during 1953 was just a little more than one and one-third million acres, a decrease of about 12 per cent under the average for the previous decade.

As in 1952, most areas experienced a better than average fire season, with the coastal provinces reporting the greatest decreases in area burned. In British Columbia, the area burned in 1953 was just a little more than 10 per cent of the average, and in Nova Scotia less than 15 per cent of the average area was burned. The Province of Quebec experienced the greatest losses in 1953, having double the usual number of fires which burned more than three times the average area lost during the previous 10 years.

The estimated values destroyed during the year amounted to just over four and one-half million dollars, which represents an increase of more than 20 per cent over the previous 10-year average. It should be noted that no provision is made in these estimates for damage to soil and site quality, stream flow regulation, wildlife or recreation values, none of which can be reliably appraised in terms of dollars.

The total area receiving some form of organized protection was reported as being approximately 1,130,000 square miles, which is about the same as that protected the previous year. Further details regarding the forest fire situation in Canada are contained in the annual booklet, *Forest Fire Losses in Canada*, which may be obtained without charge from the Forestry Branch, Department of Northern Affairs and National Resources, Ottawa.

Forest Fire Research**Petawawa**

A variety of research projects in forest fire control were undertaken at the Petawawa Forest Experiment Station, the principal one being the continuing investigations concerning fire danger measurement. Studies of weather proofing materials for the preservation of maps used in exposed conditions were completed.

Some of the other projects undertaken were studies of controlled burning on the Petawawa military ranges, the effects of water thief use on hose line pressure and discharge, and performance characteristics of newly modified threadless hose couplings. Investigations were continued on the effects of abrasion on forestry hose. The characteristics of soil sterilants and vegetation inhibitors were studied, some 60 new test plots being treated.

Saskatchewan

In co-operation with provincial forest authorities a forest fire research field party was established at Bittern Creek, about 10 miles north of Waskesiu. Primary purpose of the party was to obtain sufficient data to determine what modifications, if any, are required to make the Branch Forest Fire Danger Tables fully applicable in the Province. Fire weather conditions were not particularly suitable for these studies but, if good weather is encountered in succeeding years, the field work should be completed during the 1955 fire season.

Assistance was given in the instruction of those attending the Provincial Fire Fighting School at Christopher Lake.

Kananaskis

Two programs of forest fire research were conducted at the Kananaskis Forest Experiment Station. The major work was concerned with investigations into the effect of mountains on local weather. Entirely new techniques were devised in this study and some of the hypotheses developed in the course of the work will be of considerable importance in several phases of forestry.

The second program involved a continuation of investigations into the effect of long periods of drought on the moisture content of deep and heavy forest fuels. The program needs prolonged, dry weather for its completion but this has not occurred in the Kananaskis area since 1948.

Whitecourt

In co-operation with provincial forest authorities, a field station of similar size and purpose as the one set up this year at Bittern Creek, Saskatchewan, was opened in May, near Whitecourt, Alberta, and daily observations were obtained until the latter part of October. If the weather proves suitable, the four-man party at this Station should obtain the required data in three seasons' work.

General

Much effort was devoted to simplifying the present system of fire danger rating, and new forest fire danger tables embodying a number of simplifications were nearly completed. They will be ready for trial use in the field during the 1954 fire season. The present method of computing hazard ratings for specific fuel types is also undergoing revision.

Experimental data on fire hazard resulting from various methods of disposing of jack pine slash in Manitoba were analyzed and a report of the results was prepared for publication. It was shown that all disposal methods except piling and burning the slash resulted in an increase of hazard for several years following logging operations.

A survey of existing methods used for transporting water to forest fires accessible from roads and trails was made and the information prepared for publication. The increasing number of forest roads, and their use by the public, has resulted in a greater demand by forest protection authorities for information concerning the development and use of tankers for forest fire suppression.

In co-operation with the National Research Council, and at the request of the Associate Committee on Forest Fire Research, an 80-foot portable mast to be used for determining the relative merits of proposed lookout tower sites was designed and a prototype obtained for experimental use.

Forestry Operations Division

This Division carries out activities primarily of an administrative nature. Of these, the most important is the administration, by the Provincial Agreements Section, of the federal-provincial forestry agreements, made under the authority of the Canada Forestry Act. By these, federal financial assistance is provided to the provinces for completing and maintaining inventories of their forest resources, for reforestation of unoccupied Crown lands, and for establishment of new forest nurseries.

The Operations Division also administers the agreement under which the Federal Government undertakes to pay to the Province of New Brunswick, during a three-year period, one-third the cost (up to a maximum of \$3 million) of an aerial spraying operation against the spruce budworm in the northern part of the Province.

The Division maintains a National Parks and Northern Administration Section which has certain forest management and departmental liaison functions, and an Education Section which carries out forestry educational activities and assists in processing and distributing Forestry Branch publications and photographs (over 60,000 items of forestry literature distributed in the past fiscal year).

Towards the end of the fiscal year, under an arrangement with the Department of National Defence, the Division undertook a new function: the forest management, including forest fire protection, of the Gagetown Military Area, New Brunswick.

Provincial Agreements Section

This was the third year of the federal-provincial forestry agreements made under authority of the Canada Forestry Act. These agreements provide for Federal financial support, during a five-year period, to provincial forest inventory and reforestation programs. The present agreements terminate on March 31, 1956, but are subject to renewal thereafter.

During the period covered by the agreements, the Provinces of British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, New Brunswick, and Nova Scotia have undertaken to complete an inventory of their forest resources—now estimated as about two-thirds completed—and the Government of Canada has agreed to pay one-half the cost to each of these provinces of completing and maintaining its forest inventory in accordance with approved specifications.

As regards reforestation, provision is made in these agreements for payments by the Federal Government to the Province amounting to \$10 per thousand trees planted and \$1 per acre seeded by the Province on unoccupied Crown lands, provided that the reforestation program by the Province itself is maintained at or above the average level of the past three years. The Federal Government has also agreed to pay one-fifth the cost to the Province for establishment and operation of new forest nurseries.

As the peak of planting activity in British Columbia coincides with the end of the fiscal year, an amendment to the agreement with that Province in respect to reforestation was made. Under this amendment, federal payments to the Province for planting and seeding are calculated on a calendar-year basis instead of a fiscal-year basis. This eliminates the difficulties encountered by both provincial and federal officials in determining the number of trees actually planted as of March 31 each year.

Under an agreement with Prince Edward Island, the Federal Government is sharing, on an equal basis with the Province, the cost of carrying out a program for the reforestation of waste lands unsuitable for the production of agricultural crops.

The District Forest Officers of the Forestry Branch are responsible for the administration of the federal-provincial forestry agreements in the field. Liaison Officers have been appointed to assist the District Officers in carrying out their duties at the Calgary, Winnipeg, Ottawa, and Fredericton offices. A spirit of co-operation and mutual goodwill between provincial and Federal officials has prevailed from the outset. In harmony with this co-operative approach, Federal liaison duties are not confined to the examination of programs and reports submitted by the provinces, and to inspection of projects in the field, but, equally important, include discussions and consultations with provincial officers prior to the preparation of programs, and on the technical details of projects proposed or in progress.

In the fiscal years 1951-52 and 1952-53, Federal payments to the provinces under the forestry agreements amounted to \$802,405 and \$1,023,706 respectively, after deduction of refunds made by the Provinces with respect to interim claims. In 1953-54, actual payments totalled \$1,170,189, about 90 per cent of which was paid for work on forest inventories, and the remainder for reforestation. Total Federal contributions to date amount to just under \$3 million. Details of last year's payments and totals to date are shown in Table 1.

**Table 1—Federal Payments to Provincial Governments
under the Forestry Agreements**

Province	Forest Inventory		Reforestation		Total Federal Payments	
	Fiscal Year	Total	Fiscal Year	Total	Fiscal Year	Total
	1953-54	to Date	1953-54	to Date	1953-54	to Date
	\$	\$	\$	\$	\$	\$
Prince Edward Island .....	.....	.....	9,651	24,651	9,651	24,651
Nova Scotia	24,672	25,248	428	864	25,100	26,112
New Brunswick	12,274	44,803	.....	.....	12,274	44,803
Ontario	356,927	801,490	85,333	232,678	442,260	1,034,168
Manitoba	67,965	177,347	12,081	18,301	80,046	195,648
Saskatchewan	39,912	112,865	1,359	5,132	41,271	117,997
Alberta	81,705	376,201	.....	.....	81,705	376,201
British Columbia	477,882	1,101,574	.....	75,146	477,882	1,176,720
Total	1,061,337	2,639,528	108,852	356,772	1,170,189	2,996,300

Forest Inventories

The inventory programs to which the Federal Government is contributing under the forestry agreements are designed to provide a broad basis for the administration and management of the forests by the Provinces, as well as to furnish data for a general statement of the forest resources of Canada. Both "reconnaissance" surveys, by means of which the locations of the areas of productive forests are determined, and "provincial" surveys, intended to determine the areas of different classes of forest and to provide estimates of timber volumes for large areas, are included in this category. Federal assistance is not extended to "working plan" surveys, which provide detailed estimates of timber volumes and other characteristics for relatively small areas.

The gross area for which inventory data will be required in programs now being carried out under the forestry agreements is currently estimated at roughly one million square miles. The programs cover all provinces except Quebec and Newfoundland, which have not signed agreements, and Prince Edward Island, which is participating in reforestation only. Approximately one-quarter of the over-all inventory programs under the federal-provincial forestry agreements had been completed *prior* to the effective date of the agreements and by March 31, 1954, all inventory work in progress under the agreements was estimated as being about two-thirds completed, in terms

of the cost of work required. This compares with estimates of a little less than one-half, and approximately one-third completed, at the end of the fiscal years 1952-53 and 1951-52 respectively.

Details of work carried out on various phases of the forest inventories are given in Table 2. Some of the figures are provisional, and subject to later correction.

Table 2.—Progress in Forest Inventories

Project Class	Estimated Area to be Covered	Approximate Area Covered			Total to Date
		Prior to Fed.-Prov. Agreements	Under Fed.-Prov. Agreements Prior to 1953-54	Fiscal Year 1953-54	
	<i>sq. mi.</i>	<i>sq. mi.</i>	<i>sq. mi.</i>	<i>sq. mi.</i>	<i>sq. mi.</i>
Ground Control Surveys....	402,000	107,000	122,000	76,000	305,000
Air Photography:					
Small Scale	686,000	246,000	158,000	173,000	577,000
Medium Scale	449,000	201,000	113,000	65,000	379,000
Total	1,135,000	447,000	271,000	238,000	956,000
Base Maps:					
Small Scale	663,000	74,000	153,000	202,000	429,000
Large Scale	339,000	199,000	40,000	19,000	258,000
Total	1,002,000	273,000	193,000	221,000	687,000
Field Surveys for					
Forest Data	935,000	167,000	249,000	118,000	534,000
Interpretation of					
Photographs	1,021,000	163,000	242,000	207,000	612,000
Forest Maps	1,021,000	85,000	184,000	163,000	432,000
Inventory Reports	1,021,000	51,000	121,000	322,000	494,000

The British Columbia forest inventory program, which involves an estimated 273,000 square miles of accessible lands and 86,000 square miles of inaccessible areas, showed a steady progress during the year. Approximately 30,000 square miles of both air photography and field surveys were completed and a technique was developed for obtaining inventory information in the northern region of the Province.

The Province of Alberta extended the survey into the area north of the 57th parallel of latitude, where some 22,000 square miles of air photography were flown under contract, and over 20,000 square miles of field surveys were carried out by provincial personnel. The 80,000 square miles of forest inventory work which was completed under contract for the forest area located south of the 57th parallel of latitude was checked and accepted by the Province.

An additional 24,000 square miles of forest inventory reports was completed by Saskatchewan along with 30,000 square miles of field surveys. Work covering the provincial forests is well advanced and substantial progress has been made in the northern reconnaissance survey. The total inventory area is currently estimated at about 76,000 square miles.

On the Manitoba program, designed to cover some 119,000 square miles, work was completed on approximately 20,000 square miles of base maps and 20,000 square miles of forest maps. Progress on the other phases of the work has been maintained.

In Ontario, where the inventory program is estimated at 275,000 square miles, approximately 173,000 square miles of the more accessible forest land has been surveyed and described in published reports. The year produced about 31,000 square miles of small scale photography, 27,000 square miles of medium scale photography, 25,000 square miles of forest maps, and 72,000 square miles of forest reports. Plans for extension of the survey into the north as well as for mosaic coverage of the remaining areas throughout the south have been formulated.

Although New Brunswick now has complete base maps for the entire 28,000 square miles of the Province, the continuance of most phases of the forest inventory work has been unavoidably curtailed. However, medium scale photography of 4,800 square miles was carried out under contract during the fiscal year.

Nova Scotia began a forest inventory program under its federal-provincial agreement, to be carried out under contract for the entire forested area of the Province. Base maps and the interpretation of photographs were completed for Cape Breton Island. Plans were also made to have the Island covered by field studies during the coming fiscal year along with air photography over the eastern half of the mainland.

Reforestation

The total number of trees planted under the federal-provincial agreements now exceeds 30 millions. In the fiscal year 1953-54, some 9,386,000 trees were planted by the Provinces of Prince Edward Island, Nova Scotia, Ontario, Manitoba, and Saskatchewan. In addition, Saskatchewan seeded an area of 188 acres and Manitoba began a new forest nursery. Work was continued on new nurseries in Nova Scotia and Prince Edward Island. Details of over-all planting and seeding operations by provinces are shown in Table 3.

Table 3.—Reforestation under the Forestry Agreements

Province	Number of Trees Planted		Area Planted		Area Seeded	
	Fiscal Year	Total	Fiscal Year	Total	Fiscal Year	Total
	1953-54	to Date	1953-54	to Date	1953-54	to Date
			acres	acres	acres	acres
Prince Edward Island	29,000	48,000	25	38	.....	.....
Nova Scotia	36,000	59,000	35	59	.....	.....
Ontario	8,533,000	22,668,000	8,533	22,667	.....	6,000
Manitoba	670,000	1,292,000	587	1,093	.....	.....
Saskatchewan	118,000	567,000	81	425	188	357
British Columbia .....	.....	5,745,000	.....	6,090	.....	.....
Total	9,386,000	30,379,000	9,261	30,372	188	6,357

Aerial Spraying Operation—New Brunswick

In the summer of 1952 the forest industry and the Government of New Brunswick carried out an aerial spraying operation, on an area of 300 square miles, against the spruce budworm—a defoliating insect which is seriously threatening the pulpwood forests on more than 4,000 square miles in the northern part of the Province. On April 28, 1953, the Federal Government entered into an agreement with the Government of New Brunswick, providing for federal financial participation in a greatly expanded aerial spraying program in northern New Brunswick.

Under the terms of this agreement, the Federal Government has undertaken to pay to the Provincial Government one-third of the cost, up to a maximum of \$3,000,000, of an aerial spraying operation against the budworm during the period from September 13, 1952, to March 31, 1956. The Government of New Brunswick is also contributing one-third of the cost, the remaining third being contributed by the forest industries in the area affected.

Spraying operations in 1953 were conducted by Forest Protection Limited, a Crown Corporation organized for the purpose.* Five new airfields were constructed in addition to the one used in 1952. A total of 77 spray aircraft and 9 observation planes were employed. Between May 26 and June 30 nearly 1,100,000 gallons of DDT insecticide were applied over an area of approximately 1,800,000 acres, constituting one of the largest operations of its kind ever attempted.

Subsequent studies by forest entomologists of the Department of Agriculture showed that the average mortality of budworm larvae from spraying ranged from 87 to 99 per cent. Enough foliage was left on the trees to justify plans for re-spraying only a small part of the area in 1954. However, it was necessary to make plans for spraying an additional area of about 1,000,000 acres, on which the forest is now seriously threatened. Two airfields were constructed in the Miramichi watershed for this purpose and 500,000 gallons of insecticide were purchased.

Payments by the Federal Government to the Government of New Brunswick respecting the budworm spraying operation in the fiscal year 1953-54 amounted to \$1,000,000, distributed approximately as follows:

	<i>Per Cent</i>
Airfield construction and maintenance	25
Operational Building	4
Aircraft loading facilities	6
Aircraft operation	22
Insecticide and assessment of spraying	35
Administration and other expenditures	8
Total	100

Gagetown Military Area

By an arrangement between the Department of National Defence and the Department of Northern Affairs and National Resources, the Forestry Branch has assumed responsibility for forest fire protection and forest management at Camp Gagetown, New Brunswick. About 85 per cent of this military training area, comprising some 430 square miles, is covered with immature forest which, with proper protection and management, should eventually yield substantial revenues to the Crown. A forest fire protection service was being organized for the area at the end of the fiscal year.

Education Section

Some 60,000 pieces of forestry literature were distributed by the Education Section to schools, universities, libraries, professional and other groups, throughout Canada and elsewhere.

At the beginning of the forest fire danger season, and through the continued co-operation of the Post Office Department, postage stamp mail from several key cities throughout Canada were cancelled with special dies bearing forest fire prevention slogans. The Canada Jay, well known to forest travellers, was used as a symbol of forest protection on posters which were displayed in Post Offices across Canada, and in smoking compartments of railway cars operating to points within and outside of Canada.

Prints of "Fighting Forest Fires with Power Pumps", second of a series of Forestry Branch training films on forest fire protection, were distributed on loan to a number of government and private organizations. The first film in this series, "Fighting Forest Fires with Hand Tools", was awarded a certificate of merit by the Film Council of America at its annual Film Festival.

The window displays at the Forestry Branch Head Office, Ottawa, have continued to create interest in Canada's forests and have resulted in requests by several organizations for assistance with similar exhibits.

Approximately 300 black and white prints, and 224 colour slides were indexed and added to the photographic library of this Section, and a number of photographs were supplied on request for use in publications.

National Parks and Northern Administration Section

This Section in the main provides assistance in the administration and management of forests in the National Parks, the Yukon, and the Northwest Territories, and furnishes liaison between branches of the Department concerned with joint forestry projects.

Two foresters were employed on work assigned by the National Parks Branch, in Banff and Jasper National Parks respectively. At Banff, basic fire control planning data were obtained, and a number of maps for the fire plan were completed. Use was made of air photographs for this purpose, as well as in other aspects of forest management. Co-operation was maintained with forest entomologists and pathologists, and other forest research workers. Information was obtained with a view to the establishment of a small forest nursery, a timber cruise was made and reports were prepared relating to cutting operations in the park.

Progress was also made in Jasper National Park in the preparation of a detailed fire protection plan and in organizing forest fire-fighting facilities and personnel. Air photographs and base maps of the park were obtained for a forest inventory, on which work has been started. A cruise of the previous year's cutting area was completed; assistance was given to foresters engaged in research projects, and to forest entomological and pathological studies in the Jasper area; and lectures in forest protection were given at the annual wardens training school.

Work was continued on the forest inventory of the Yukon Territory, in co-operation with the Northern Administration and Lands Branch of the Department and the Forest Inventories Section of the Forest Research Division. Provisional forest maps covering 4,320 square miles and revised forest maps of 1,300 square miles were prepared. Some 621 sample plots were measured by a field party during the summer months.

Forest Products Laboratories Division

Industrial interest in forest products research data continues to increase, especially in those phases of research related to a more effective and more complete utilization of all available wood substance. This growing interest is particularly evident wherever wood products are in competition with other materials intended for similar uses.

Developments in industrial processing and manufacturing have been closely followed in order to permit assessment of indicated trends. Research work can thus be oriented to provide basic and factual information necessary to the changing pattern of production and use.

The structure of the wood of various Canadian timber species has been under study in endeavours to determine the effect of structure peculiarities of lumber on the use in service. This enables different woods to be channelled more effectively to the uses for which they are best suited.

Utilization of sawmill waste poses many conversion and economic problems. Yet, from this source there are very large quantities of valuable wood substance for which there is no ready industrial outlet. Sawdust, available in large quantities and suited to mechanical handling, offers a continuing source of supply. Research has included the successful pulping of sawdust, on a laboratory scale, by a modified chemical technique, and the paper made from this pulp was of satisfactory standard. It is now planned to investigate the economics of its possible commercial production.

Studies of barking methods and techniques for the conversion of slabs and edgings have been continued. Pulp chips from this material are being used in increasing quantities for the production of paper. Investigations have also shown that softboards and hardboards of high quality can be produced from this material.

Packaging investigations have been numerous and the demand for research data on containers has continued to increase and to cover a widening field. Actual use data under normal trade and transportation practices are being collected to permit comparison of laboratory tests with commercial use experience.

Considerable research work has been carried out for the Department of National Defence. Rifle furniture has been built from laminations and indications are that it will prove superior to furniture from solid wood. This is of particular importance since suitable solid wood for this purpose is in limited supply. Investigations have included a number of studies pertinent to the packaging and bulk handling of military stores.

Another co-operative study is being carried out with both the Department of National Defence and the Division of Building Research of the National Research Council. The investigations are aimed at determining the effectiveness and durability of paints of various formulations when applied to plywood and hardboards and exposed to the extreme climatic variations and atmospheric conditions in different parts of Canada.

In a new field, supersonic equipment has been installed. It is intended to investigate the possibility—through the use of supersonics—of determining the strength and other properties of wood. This step has been taken in accord with the policy of the Laboratories to bring to the study of wood all possible scientific aids, so as to serve with increasing efficiency the vast network of woodworking industries.

"Research in Forest Products" is the title of a Film Strip produced by the National Film Board from material supplied by the Division. A commentary for use with the strip was prepared. This strip (copies available from N.F.B.) was shown to a number of groups. Comments have indicated that its use serves to better demonstrate the importance and value of research.

The draft of Volume 2, *British Commonwealth Forest Terminology*, was received from the Empire Forestry Association. This volume includes "Terms and Definitions for Use in Forest Products Research", the original draft for which was prepared by this Division, as well as "Utilization Terms". The copy was checked with special reference to forest products research terms and found satisfactory.

Nineteen technical reports, translated for the Ottawa and Vancouver Laboratories, were mimeographed and distributed to co-operating Commonwealth, United States, and Scandinavian research institutions. Exchange translations continued to be received from co-operating laboratories.

The annual Lumber Seasoning Courses were held at Ottawa and Vancouver. Purpose of these 5-day courses is to keep industry informed of improved techniques and developments in the kiln-drying of wood products.

Committee and Special Meetings

The Advisory Committee on Research, Ottawa Laboratory, met in May. The main meeting was preceded by sessions of the Subcommittees on Wood Preservation, Timber Engineering, Lumber Seasoning, and Sawmilling. Industrial members of all committees reported growing appreciation of the importance of research to industrial progress. The discussion of research programs and of industrial problems provides a valuable guide in the planning of research.

Considerable time was devoted to work in connection with the revision of the National Building Code, with special reference to the assembly of technical data and committee work relevant to the preparation of those sections of the Code dealing with wood.

The Annual Meeting of the Canadian Standards Association Sectional Committee on Timber Standards was held at the Ottawa Laboratory in December. Arising from this meeting, action was taken to organize a subcommittee (under F.P.L. direction) to explore the possibility of obtaining greater uniformity in lumber grading and sizes

in Canada and, possibly, to establish National Standards for the grading of yard lumber. Action was also taken to organize a committee for the preparation of C.S.A. Specifications for Engineered Design in Timber—on which F.P.L. members are active. This will entail, during the coming year, a considerable volume of specific research.

Representatives of the Laboratories were also active on other technical committees, such as the Eastern Spruce Grading Committee, the Fundamental Research Committee and the Testing and Control Committee of the Canadian Pulp and Paper Association; the Paint, Furniture, Packaging, Cutting Tools, Fire Test, Paper Products and Building Board Technical Committees of the Canadian Government Specification Board; Glued Laminated Construction, Millwork, Wood Preservation, and Packaging Committees of the Canadian Standards Association; Wood Committee, American Society for Testing Materials; Preservatives Committee, American Wood Preservers Association; Treated Plywood Committee, B.C. Plywood Manufacturers' Association, the B.C. Lumber Manufacturers' Committee on Fire Regulations, and the Hardboard Testing Committee, Northwest Section, Forest Products Research Society.

Representatives of the Laboratories attended a number of conferences and meetings which included: Building Research Conference at the National Research Council, Ottawa; Northeastern Wood Utilization Council Meeting on Wood Waste Utilization, Syracuse, N.Y., U.S.A.; American Wood Preservers Association Preservative Committee Meeting, St. Louis, Mo.; Annual Meeting, Federation of Paint and Varnish Production Clubs, Atlantic City, N.J.; Annual Conference, Packaging Association of Canada, Toronto; Semi-Annual Meeting of the Northeast Section, Forest Products Research Society, New Haven, Conn.; Annual Meeting, Eastern Canadian Section, F.P.R.S., Ottawa; Semi-Annual Meeting, Pacific Northwest Section, F.P.R.S., Seattle, Wash.; Annual Meeting, Western Forestry and Conservation Association, Seattle, Wash.; Annual Convention, Canadian Lumbermen's Association, Montreal; Annual Convention, Ontario Retail Lumber Dealers Association, Toronto; Annual Conventions, Technical Section and Woodlands Section, Canadian Pulp and Paper Association, Montreal; Annual Meeting, Canadian Institute of Forestry, Winnipeg; Meeting, Technical Association, Pulp and Paper Institute, New York, N.Y.; Meeting, American Society of Testing Materials, Committee D-7 on Wood, Chicago, Ill.; Annual Convention, Truck Loggers Association, Vancouver; Seventh B.C. Natural Resources Conference, Victoria; Meeting, West Coast Bureau of Lumber Grades, Portland, Ore.

Technical Assistance

During the year, 2,705 requests for technical information were received. Of these, 1,886 were dealt with by the Ottawa Laboratory and 819 by the Vancouver Laboratory. Many specific industrial problems—where results would have general application—were also studied. An increasing number of industry representatives visit the Laboratories to discuss production problems with staff members. In addition, some 17,000 publications were distributed.

Special investigations on the properties of new products and on container design, gluing, engineering, and painting problems were undertaken for Central Mortgage and Housing Corporation, and for National Defence and other Government Departments. These investigations, together with those undertaken for other agencies and industrial firms, and the answering of technical inquiries, form an important part of the activities of the two Laboratories.

Buildings

The preliminary plans for the proposed new Vancouver Laboratory were completed by the Architectural Branch, Department of Public Works. Action was initiated towards obtaining the site that has been offered by the University of British Columbia. Provision was made in the 1954 departmental estimates for the purchase of a site for a new Ottawa Laboratory building.

Brief reports of the more important work completed or under way at Ottawa and Vancouver follow.

Ottawa Laboratory

Timber Mechanics Section

Apparatus was designed, built, and installed for the study of methods which would result in a more efficient use of wood in house design and construction. This included a racking test machine, wallboard puncture machine, and improvised equipment for testing complete timber trusses. Preliminary tests were carried out and testing technique verified. Specific studies were commenced and the work is continuing.

Research studies on wood adhesives were continued, with special reference to the curing properties of resorcinol resin glues and methods of testing urea resin glues. An investigation was made to determine the relative ease of gluing the wood of timber species in Eastern Canada with different types of wood adhesives. Accelerated durability tests in a weatherometer were made on plywood adhesives to investigate the correlation between results obtained and those from outdoor exposure tests.

The veneer cutting properties of aspen poplar were further studied, using veneer bolts from northern Ontario where there is a growing interest in the utilization of aspen poplar for plywood. From this work, further improvements were developed in the technique for rotary cutting of poplar.

Through a long series of cutting experiments, considerable progress was made in developing a satisfactory technique for rotary cutting smooth veneer from curly-grain yellow birch logs. Smooth, flexible veneer 1/28-inch thick was successfully produced from curly grain birch normally considered unsuitable for rotary cutting. Co-operative studies with industry have been initiated to determine if the Laboratory's technique can be used for commercial production.

Work was undertaken for the development of moulded plywood rifle furniture of increased strength-to-weight ratio for a new type of small arms being investigated by the Department of National Defence. A technique was evolved for moulding the plywood to the shapes required, and rifle furniture of several designs was produced and tested. A sufficient number of sets of the final design were produced for use in field trials.

A considerable number of special investigations on glues, plywood, and laminated wood products were made at the request of government departments and Crown companies. Included in these were tests on glued joints for use in stake body trucks, wall panels of various constructions, glue bonds in laminated-oak ship members, and in plywood for special requirements, plywood doors, glued building components, and plywood flooring.

Problems of importance to the over-all economy of packaging of materials were studied both for industry and for defence purposes. Of immediate importance were the study of less expensive containers for the shipment of poultry products, an investigation of the effectiveness of separators for bottles packed in cartons, and the testing of new containers for the transportation of explosives.

Several studies of packages were made to improve the methods now used for handling military stores, both for application in the warehouse and under service conditions. Palletizing of loads has become general practice in handling material and as a consequence there has been considerable interest in the design of wooden pallets of many different types. Tests were made to evaluate a number of these, produced from different wood species.

Improvements in container design were proposed in an effort to reduce the cost of packaging glassware, without sacrificing the protective value of the containers. Studies were also made to determine the best methods of providing interior cushioning for articles—such as instruments of various types and sewing machines—which require high protection from shock while in transit.

Wood Preservation and Pathology Section

To determine the actual service performance of experimentally-preserved cross ties, the Laboratory has established, in co-operation with Canadian railways, a number of short track sections as test areas. Some of the ties in these sections were treated at the Laboratory, and the Laboratory has been supplied with treating data on the remainder. These ties serve under normal conditions of exposure and receive the usual maintenance. The first test track was installed in 1920, is still in test, and more than half of the original ties are still in place. Of a total of nine test tracks, ties in eight were examined during the year and service life data recorded for various preservatives and treatments.

Certain areas in Western Canada produce crude petroleum oils deficient in gasoline-yielding components but rich in asphalts and heavy petroleum tars. In an endeavour to utilize these oils, experiments have been made, on a pilot plant scale, to process one oil at high temperatures. Because the possibility exists that some of the products derived from the high temperature processing of this petroleum oil may have value as wood preservatives, experiments have been undertaken at the Ottawa Laboratory to ascertain the preserving value of one of the products thought most likely to be suitable. Toxicity tests have, however, shown it to be rather low in toxic value against a standard wood-destroying fungus. Soil-block accelerated decay tests are being carried out to serve as a check for this result.

Because of the interest of industry in simple methods for the preservative treatment of lumber for railway car construction, exploratory tests were carried out to find out if, by means of the soil-block accelerated decay technique, it was possible to determine the probable increase in service life resulting from the dipping of car lumber in a preservative solution. The dip-treated blocks decayed less rapidly than did the untreated controls. However, it was apparent that the soil-block technique was unsuited to determine increased resistance of dip-treated lumber.

The increasing demand for poplar for the production of pulp and paper has focused attention on the decays to which this species is subject. It is of importance to the industry to know if the organisms causing decay in the living tree continue to attack logs piled in the woods and at the mills. This study has been under way for several years and it is now evident that the fungus, which accounts for a large percentage of the decay in poplar, dies out rapidly after storage of the logs for one year. A number of other fungi which decay the living trees to a lesser extent remain very active in the stored logs for at least two years, and sometimes cause further appreciable decay. Most of the storage decay, however, is attributable to three or four species of fungi which enter the logs during the storage period. No toxic chemical or coating has yet proved entirely effective in protecting hardwood logs from these and other wood-decaying fungi.

Yellow birch has become the most widely used hardwood for the manufacture of veneer and plywood in Eastern Canada, and its decay in storage is causing serious alarm. Submerging of the logs in water is the only preventive method now known. However, a new approach to the prevention of its decay has been initiated, along the lines of biological control which have proved so successful against disease-causing organisms in humans. In the past few months, in preliminary tests, a number of wood-inhabiting moulds have proved antagonistic to the growth of several fungi commonly causing storage decay in birch. This suggests that the incidence of decay in hardwood logs may be affected by prior infection of the logs with moulds or other fungi. The investigation will be continued by growing the antagonistic organisms in association on culture media and on wood blocks.

Studies have been carried out in an attempt to develop a practical small-scale test for evaluating, quantitatively, the fire-retardant characteristics of a paint film. Ignition of the paint film, in tests, has involved the use of an electric element rather than the usual flame. It has been possible to show a difference between paints which

suffer relatively little surface damage while allowing the under surface to be charred severely, and those paints whose surface is destroyed completely while the underlying wood is protected.

A serious problem in the use of Douglas fir plywood for wall and roof panels is its tendency to face-checking as it ages. The Laboratory is studying a large number of painting systems to learn which will best withstand the action of such checking, and in co-operation with the Division of Building Research, National Research Council, and the Directorate of Engineer Development, Department of National Defence, large test panels have been erected at Halifax, Ottawa, Saskatoon, Norman Wells, and Vancouver, encompassing the extremes of climatic variation in Canada. These panels were erected in the summer of 1953 and are to be inspected twice yearly to determine the relative rates of face-checking. Included in this study are a number of hardboards, whose surface fibres—if not properly protected from the weather—may lift and thus expose the interior of the board to the effects of moisture absorption.

Hardwood as a flooring material is being largely replaced by other products such as linoleum and mastic tile, principally because of the problems of its maintenance and the lack of suitable finishes which do not discolour or wear in service. In an attempt to solve some of these problems a section of hardwood flooring has been laid in a heavily-travelled corridor in the Laboratory and finished with various materials. During the last six months it has been noted that a so-called "synthetic" finish maintains its appearance very well, whereas a floor treated with linseed oil or floor-wax is objectionable as a dirt collector. These sections are being maintained merely by waxing and polishing, and in the course of time it is hoped to demonstrate the very great wear-durability of the wood itself.

Wood Chemistry Section

Studies on the production of structural boards from various types of mill waste were continued, special emphasis being placed on binder board research, as this type of product is becoming increasingly important as a core material. Research was aimed at determining methods for reducing production costs through the use of a cheap binding material. Promising results were obtained by the use of western red cedar and Douglas fir bark, in combination with sulphite waste liquor.

The initial work on the possible utilization of spruce sawdust by pulping with chlorine dioxide was expanded to include poplar and birch sawdust. Material from these species produced pulps with remarkable strength properties. Their evaluation showed them to be in the same strength range as other chemical pulps and to be of possible interest not only for the production of paper, but also for acetylation and nitration. Although the pulping of sawdust by a modified chemical technique has been highly satisfactory, no attempt has yet been made to investigate the economics of possible commercial production. Nevertheless, and because of the large quantities of sawdust available, it may well be anticipated that pilot plant studies will follow laboratory experiments.

In the studies on the possible microbiological utilization of wood waste there has been particular emphasis on the fermentation of cellulosic material by rumen bacteria. The specific nutritional requirements of these organisms have been studied, as well as methods for continuous removal from fermenting systems of organic acids formed during fermentation.

Wood Utilization Section

A series of tests undertaken at the Research Sawmill yielded valuable information on the amount of power required to saw various commercial species and the optimum saw speeds to be used with various feed speeds. These tests were conducted as an aid to the sawmill operator in choosing and modifying sawmill equipment and in the operation of equipment so as to improve utilization and reduce waste. Results of these investigations were published.

An adjustable gauge for setting and controlling lumber thickness at the headsaw, designed and built at the Research Sawmill, permitted the sawing of much more accurately sized lumber and thus reduced waste.

The possibility of using small second growth and defective hardwood trees is a subject of considerable economic interest. Field investigations conducted at short-log bolter operations to determine the feasibility of the use of this type of equipment in the conversion of second growth hardwood showed that considerably more time was required to produce lumber with bolters than in conventional sawmills. Results indicated, however, that increased production cost was offset, partially or wholly, by the increased value of the product.

At the request of a committee which was organized by the Forest Products Laboratories Division to co-ordinate research work on the utilization of sawmill waste for pulpwood, information on all known types of barkers, portable chippers, and on numerous methods for transporting waste was collected and published in a bulletin entitled *The Use of Sawmill Waste for Pulpwood in Eastern Canada*. A published article entitled, "Developments in Mechanical Barking" was reprinted and given wide distribution.

A survey, conducted at the request of, and in co-operation with, the Saskatchewan Department of National Resources, was aimed at determining the volume and character of the wood left as waste on logging operations in Saskatchewan. Results showed that, on the average, a total of 7.1 per cent of the merchantable volume of the original stand—exclusive of residual trees that would contribute to a future cut—was left in the woods as logging waste. The extensive use of tree-length logging was an important factor in this relatively low waste percentage.

In co-operation with the Nova Scotia Department of Lands and Forests, investigations were conducted on two representative logging and sawmilling operations in that Province to provide a method of determining the profitability of removing logs of different species and sizes from the woods. These data are of high interest to both the sawlog industry and provincial governments.

The possibilities and economic advantages of drying lumber at temperatures above the boiling point of water are of wide interest throughout Canada, and studies in progress at the Laboratory were continued during the year. Preliminary experiments on commercial softwoods indicated that high temperature drying held considerable promise, and additional charges of western red cedar shingles and of yellow birch were dried. A new kiln of improved design in which to continue these studies under carefully controlled conditions has been designed and is being built.

Tests on the absorption of moisture from the surrounding atmosphere by kiln-dried lumber during the various seasons of the year were conducted on four species of lumber. Results have shown that the moisture content of lumber, under shelter but otherwise exposed to outdoor atmospheric conditions, increased very rapidly. Under some conditions the moisture content rose from 4 to 8 per cent in as little as two days. For effective storage it was found that close piling and end coating were an absolute necessity.

Wood Structure Section

Studies were carried out on the effect of anatomical structures of wood on the dimensional changes that occur in wood in response to changes in its moisture content. It was shown that the rays in wood—strands of tissue which extend radially across the grain—shrink significantly less in response to loss of moisture than does the fibrous wood that surrounds them. The differences between the potential shrinkage of rays and the surrounding wood were found to be sufficiently high to constitute the principal factor in causing the radial shrinkage of wood to be typically less than the tangential shrinkage.

Investigations were continued of anatomical types of compression-wood and the effect of various types of this defect on the shrinkage, density, and mechanical properties of wood. Tests thus far carried out indicate that mechanical properties of wood from trunks containing compression-wood show no particular weakening in samples tested in green condition, although shrinkage of the wood along the grain is abnormally high.

A simple method has been developed for determining the fibre saturation point of sapwood by centrifuging under certain controlled conditions. Though further studies on the technique are indicated, it may be possible to develop the test for use in detecting and in appraising the effect on wood of heat, chemical treatments, and incipient decay.

Among the natural defects and blemishes of wood, the so-called mineral streak of hardwoods—particularly sugar maple—was studied. The presence of white amorphous deposits in pores of sugar maple observed in the neighbourhood of the typical greenish streaks in specimens showing abundant mineral streaks is taken to be a diagnostic characteristic of mineral streak. Observations indicate that mineral streak is often associated with decay in standing trees and is typically found in suppressed stands where growth is relatively slow.

Vancouver Laboratory

Timber Mechanics Section

There are large stands of fire-killed lodgepole pine timber in the foothills of southern Alberta. Much of this timber is of a size suitable for use in the many coal mines which are distributed throughout the area. Reluctance on the part of some mine operators to utilize this convenient source of pit props was a deciding factor which led to the decision by the Vancouver Laboratory to initiate a testing program to determine to what extent strength properties are affected by fire-killing and subsequent weathering for various periods of time. Initial investigations indicated that fire-killed material does not suffer serious loss of strength for periods up to seventeen years. Material was secured from two additional age-classes for testing. The age distribution was chosen to include material from those ages which might reasonably be expected to be of economic importance and for which reliable information based upon adequate strength data is desirable.

The effect of seasoning upon the circumferential dimensions of round timbers is of importance because of the customary procedure of classifying poles by diameter classes while the poles are still in the green condition. To obtain data, two hundred poles of western hemlock and Douglas fir were purchased. These were measured in the green condition and again at various times during the drying season. Half of these poles were pressure treated with a creosote-petroleum mixture to make possible comparison of drying effects on treated and untreated poles. Results indicate that shrinkage and loss of strength through seasoning need not be of major concern.

A report upon the test loading of a composite concrete-timber deck bridge was published. Although this type of construction is becoming increasingly popular, it was not introduced into Canada until 1951 and, because of the absence of any test data on local structures, there has been reluctance in some quarters to accept design premises. These tests have provided a record of actual deflections at all critical points when subjected to maximum design load and indicate satisfactory performance and stiffness.

The seasoning of veneers for the manufacture of Douglas fir plywood is performed on a mass production basis. Drying is done at much higher temperatures and in drastically shorter times than are used normally for drying wood products. Studies to date indicate that drying at excessively high temperatures, even for short periods, considerably reduces the strength of the wood and causes failure to occur by rupture of the wood cells, rather than by a lack of adhesion as was at first supposed.

At the request of industry a series of plywood web beams, variously constructed to resist shear deformation in the webs, were tested to destruction. From the results of these tests it was possible to make specific recommendations concerning the most economical and efficient methods of increasing the resistance to shear.

Demountable plywood joints which might be employed in such temporary structures as farm shelter sheds and auxiliary grain bins have occasioned considerable interest. An investigation of several designs was undertaken and the examination of failures and ultimate loads made possible the elimination of unsatisfactory designs and indicated others worthy of further development.

Prefabricated wall and roof panels, of glued construction throughout, and complete with built-in insulation and vapour barriers were tested. Results indicated that all panels were of adequate strength and suitable for first class dwelling construction. Particular care was necessary, however, to assure a satisfactory glue bond between the wood and the sheet aluminum vapour barrier which was incorporated beneath the face ply of the interior facing. Tests of a new type of beam of triangle web construction developed in Europe showed promising results.

Wood Preservation and Pathology Section

A new experimental wood preservation retort is nearing completion. It is twenty-four inches in diameter and sixteen feet long and has been designed to withstand pressures up to 180 pounds per square inch. This size of retort is of sufficient cross-section to contain wood in sizes ordinarily pressure treated. Automatic temperature and pressure controls are similar to those on commercial retorts. Several new features, for use during boiling under vacuum, include a specially designed manometer to indicate the flow of vapour, a glass-covered opening to observe foaming in the vapour line, and heating jackets to prevent accumulation of naphthalene.

Special laboratory equipment has been designed and built which enables determination to be made of the vapour pressure in wood heated in preservative. The information relating vapour pressure to wood moisture content holds promise of being useful both in the laboratory and in respect to commercial processes where moisture is boiled from wood to facilitate impregnation.

The addition of moisture to air-seasoned mountain-type Douglas fir, by impregnation with water under pressure and by steaming followed by vacuum has been found to improve penetration and rotation of preservative, although the reasons for this behaviour and the conditions which provide maximum improvement have not been ascertained.

A study was begun to determine the causes of some indicated instances of erratic decay resistance of western red cedar roof shingles in the United Kingdom. Possible causes, which may be readily adjusted in the course of manufacturing practice, are now being investigated. These include the relationship of both kiln temperatures and colour to durability of the shingles. The soil jar technique—with modifications developed at the Laboratory—is being used to compare the relative resistance to decay of light and dark coloured wood, and of wood of both these kinds dried at three different kiln temperatures. Chemistry techniques will be used to identify and measure the extractives left behind after the various kiln-drying runs. These extractives are the basis of the durability of western red cedar heartwood.

A fungus was isolated from decayed shingles returned as specimens from the United Kingdom. It is believed that this is the first time on record in which a pure culture of a wood-destroying fungus has been isolated from cedar shingles decayed in service. Transplants of the fungus are being used to inoculate the light and dark coloured cedar specimens in the decay resistance studies.

A reference collection of pathological material was augmented during the year. A herbarium was started, containing fruit bodies of wood-destroying fungi of known identity and origin, as well as samples of decayed wood of which the causal organisms

have been identified. A comprehensive collection of wood-destroying fungi in culture, some of which are kept under mineral oil, is also maintained, and a file is kept of samples of unusual lumber defects. The whole collection is valuable as a source of reference in the identification of unusual lumber defects—which may sometimes be the cause of commercial claims—or in the identification of organisms which may be the specific causes of decay.

Lumber in storage or transit may sometimes be attacked by staining or mould organisms, causing degrade and lowering of value. For this, various anti-stain chemical dips in water solution may be used as a palliative before shipment. During the year, a series of experiments on the comparative value of a number of compounds was completed and the results were published. The list included a number of dips which had not been investigated elsewhere. Particular attention was paid to the desirability of discovering dips that would be harmless when applied to wood used for containing foodstuffs such as fruit.

Wood Chemistry Section

The study of the chemistry of western red cedar was continued. Among its most interesting constituents are the thujaplicins, which are potent, naturally-occurring fungicides of potential interest and their presence in cedar is believed to be largely responsible for the well-known durability of this species. Analytical results indicate that the thujaplicin content of a sample is dependent on its colour and location in the tree. Light coloured wood contains more than the darker coloured wood adjacent to it. Colour being equal, the thujaplicin content increases with increasing distance from the pith. The outer, straw coloured heartwood, large quantities of which are disposed of by burning in shingle manufacture, is a specially rich source. This discovery may be of considerable importance in view of the great difficulty of synthesis of these compounds and their potential usefulness in medicine.

Results of concurrent studies on the content and character of the water-soluble phenols of cedar heartwood also showed a marked dependence on colour and location of the sample within the tree. These results together with those on thujaplicin analysis indicate a radical difference between the chemistry of the light and dark coloured heartwood.

A method was devised for isolation of one of the polyphenolic constituents of the water soluble portion of the heartwood, and studies were begun on its chemical properties and constitution. The knowledge of cedar chemistry being acquired in these studies has proved useful in providing technical assistance to the industry on cedar utilization problems.

Wood Utilization Section

Field parties continued to study logging methods in the interior of British Columbia. Time studies, made on felling and bucking sets to determine the relative efficiency of different methods, indicated that one man can fall and buck more timber per man-hour than two or three men can working together. It was also found that the efficiency of the fallers increased with increase in diameter of the trees.

Another field party investigated the losses in volume and value of lumber during seasoning and planing. Losses in value were not as great as generally anticipated. This party also measured the amount of lumber recovery from representative larch butt logs. Much of the overmature larch found in certain areas contains a great deal of shake in the butt logs. These logs are often left in the woods. A sample of these logs was taken to a sawmill, manufactured into lumber, air-dried and planed. It was found that after drying and planing less than half the lumber cut could be considered merchantable. It was thus shown that most of these logs were unsuited for lumber.

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1953 Annual Report

CANADIAN GOVERNMENT TRAVEL BUREAU

Canada's tourist industry enjoyed record revenues from visitors in 1953. Tourists from other countries spent \$302 million in Canada. This was almost ten per cent ahead of 1952, and six per cent over the previous record established in 1949. Visitors from the United States spent \$282 million, the remaining \$20 million representing expenditures by guests from overseas countries. The gain in receipts indicated slightly higher average expenditures per visit in 1953.

Another record was established for the number of individual entries into Canada, over 28,000,000, of which long-stay automobile entries exceeded 2,500,000 for the first time. More than 3,000,000 persons visited the National Parks of Canada, and the Canadian Government Travel Bureau serviced more than 434,000 inquiries.

These records were established in the face of a heavy flow of visitors to Europe, especially to Great Britain during Coronation Year, and notwithstanding increased advertising and publicity campaigns carried on by competing countries and individual states of the United States.

Functions of Travel Bureau

The Canadian Government Travel Bureau is the federal agency responsible for the promotion of travel to and within Canada and for the interests of the tourist industry in general.

The Bureau operates a ground-floor information office in New York City, located at 11 West 49th Street in Rockefeller Center, and maintains a staff representative at an information office in the Canadian Consulate General, Chicago. At Los Angeles, there is a special travel consultant in the Canadian Consulate General at 510 West Sixth Street.

Eighth Federal-Provincial Tourist Conference

The Eighth Federal-Provincial Tourist Conference was held in the Centre Block of the Parliament Buildings on November 30th, December 1st and 2nd, under the chairmanship of the Honourable Jean Lesage, Minister of Northern Affairs and National Resources, with R. Gordon Robertson, Deputy Minister, and D. Leo Dolan, Director, Canadian Government Travel Bureau, as deputy chairmen. The Conference discussed all phases of Canada's tourist promotional efforts and approved a report submitted by the Special Committee regarding the co-ordination of advertising between Federal and Provincial Governments and the transportation companies of Canada. In view of mounting advertising costs and increased competition for the travel dollar, the Conference urged that consideration be given to ways and means of enabling Canada to maintain and extend the favourable position she now enjoys in the field of international travel. The Conference approved a resolution urging the appropriate authorities to seek to have all provinces adopt uniform regulations governing the transportation by tourists of firearms and other sporting equipment.

Advertising Campaigns

Magazine space in both colour and black and white was again used to give photographic display to Canada's beauty spots and tourist attractions in fifty-five magazines, including general publications, women's magazines, and travel, teachers', sporting, motoring and other specialized publications with a combined circulation of approximately 200 million copies.

The Travel Bureau magazine advertising was concentrated mainly in the "travel decision" months of February, March, and April.

The newspaper campaign was built around testimonial phrases extracted from Travel Bureau files. Copy was kept short and given bold display. The advertisements appeared in 50 newspapers from early April to mid-June, with highest frequency in the early weeks. The advertising program produced a 47 per cent higher return of inquiries than the previous year's campaign. The total cost of advertising was \$931,351.

Publicity

Publicity activities reached a new high, as indicated by photographic mailings, which set a record of 6,334 black-and-white prints sent to magazines and newspapers in Canada, the United States, and abroad. The Bureau won the 1953 Midwest Travel Writers' award for the best travel photo coverage of any organization outside the United States. Use of material prepared by this Division by newspapers and magazines was greater than in any previous year.

Distribution of picture-stories was again carried out successfully, and stories included "An Autumn Call To Canada", "When Winter's King in Canada", "Honeymoon in Canada" and "Springtime in Canada".

Twelve monthly releases of the Canadian Travel News Letter, eight Calendar of Events and one Ski Events were produced and distributed. There were several releases of Convention Lists, but this publication was discontinued in the spring of 1953.

Publicity on behalf of the National Parks of Canada was largely integrated with general travel promotion, and included a number of articles prepared for various publications in Canada and the United States and several releases on National Parks attendance.

The 1953 edition of the Alaska Highway booklet was produced, and also a new version of the "Winter Sports in Canada" booklet. An extensive promotional mailing campaign was carried out to bring Travel Bureau and National Parks literature and other promotional material to the attention of national associations and 250 editors of company house organs in the United States.

In 1953 the Bureau undertook to provide a mat service to United States weekly newspapers through a service reaching 2,000 such media. For the first time in the postwar years the newspapers in the smaller U.S. communities received regular Canadian travel publicity.

In the autumn the Division took over supervision of the Bureau's library of still photographs and engravings. A new system of cross-indexing photographs was established, and the photo library was reorganized to facilitate the handling of increasing numbers of colour transparencies and black-and-white prints.

Motion Pictures, Television and Radio

The Canadian Travel Film Service was expanded by adding 340 prints and 14 new subjects to the films in circulation in the United States. In co-operation with the National Film Board new outlets were established making these films available from over 100 outlets in 42 states and the Territory of Hawaii. Circulation of 3,144 prints comprising 125 subjects resulted in 50,767 direct screenings to audiences totalling 3,671,850—a substantial increase over last year.

The availability of these films was mentioned in a portion of the Bureau's advertising schedule and resulted in 11,420 direct film inquiries.

In Canada 1,704 prints of 56 travel subjects were screened on 21,198 occasions to 1,567,048 people—including visitors who enjoyed the special summer tourist program.

Three new films were undertaken, two of which will be released early in 1954. "Maritime Holiday" portrays a typical family on vacation in the Maritime Provinces. "Wardens of Waterton" records the activities of the park wardens as guardians of Waterton Lakes National Park. The third production, planned to depict the experiences of visitors touring Canada by private plane, undertaken by the National Film Board, was not completed owing to adverse weather and other conditions.

Seventy-seven prints of the new tourist educational film, "Travellers' Cheques", released in Canada early in 1953, were by the year end screened on 1,058 occasions to a total audience of 62,840.

In the United States 48 Canadian travel films were telecast on 379 occasions. In Canada 20 of these film subjects were telecast on 55 occasions.

A special program "Canada-Vacations Unlimited" was telecast over a three-month period on the Canadian network using film and guest artists. A thirteen-week radio program over CBC's national network promoting vacations in Canada's National Parks was presented in the spring of 1953.

Parks Publicity

National Parks publicity in 1953 received increased attention, with nearly half of all Travel Bureau material emphasizing the Parks.

Several special projects were undertaken, including the mailing of prints of Mount Eisenhower in Banff National Park to the leading daily newspapers in the United States, to coincide with the inauguration of President Eisenhower; the picture was printed by many of them. An illustrated article on the National Parks went to a picture magazine in Germany, wildlife prints went to a New York author for book publication, many National Parks photographs were provided for publication in a literary guild selection, "Around the World in 1,000 Pictures", (first printing over 100,000 copies), National Parks were featured in three leading trailer magazines that used Travel Bureau photographs, and the outstanding domestic placement of the year was that of 25 stories and 30 photographs in the *Moncton Times-Transcript*, the broadest coverage of the National Parks system ever obtained in a single newspaper.

The Travel Bureau's advertising in more than 50 leading U.S. magazines was illustrated by a considerable proportion of National Parks photographs.

Information

During the year the duties of the Information and Visual Aids Divisions were merged for greater efficiency. This division handled 151,451 special inquiries, an increase of 17 per cent over the previous year. The division made good progress in revising canoe route outlines and charts. One of its functions is collating yearly regulations and schedules, such as fishing and hunting regulations, and gathering information for a series of processed and printed publications.

Publications

There are 58 different publications prepared and distributed by the Travel Bureau. Nine of these are also printed in French, making a total of 67 separate publications. Of this number, 15 are processed in the Bureau's Duplicating Section and the remainder are supplied through the Queen's Printer.

In addition to the travel literature used in answering specific inquiries, or for promotional projects, quantities are supplied to transportation companies, automobile clubs, provincial and local tourist bureaus, travel agents, industrial organizations, Chambers of Commerce, oil companies' tourist service bureaus, newspaper public service bureaus and other travel information outlets. Up-to-date mailing lists are maintained, and copies of all new publications are sent to these agencies together with a printed card for ordering further supplies.

Substantial quantities of Canadian Government travel literature are distributed through the Bureau's three offices in the United States, at New York, Chicago and Los Angeles, as well as in the National Parks, from Canadian Customs offices at border crossing points, from Canadian Embassies and Consulates abroad, and at travel shows in both Canada and the United States. In an effort to stimulate interest in conventions held in Canada, quantities of literature are supplied to convention organizers for distribution to prospective delegates. Quantities of travel posters are distributed for display in stores, theatres, schools and other places frequented by the travelling public.

Still Photographs

During June, July, and August the National Film Board was commissioned to carry out three photographic schedules, one each in Western Canada, the Maritimes and Northern Ontario. The coverage was in both black-and-white and colour. A winter program was carried out in the Laurentian region of Quebec.

Private sources for the purchase of good photographs were carefully investigated, and a number of pictures were obtained, especially in areas not normally covered by the Bureau's summer photographic schedules.

Director's Special Activities

The Director attended the Second Pacific Area Travel Conference in Honolulu, Hawaii; the National Association of Travel Organizations Convention at White Sulphur Springs, West Virginia, and the annual meeting of the Canadian Tourist Association in Vancouver. He was one of a panel of judges, and presented the awards, at the Culinary Arts Display of the Canadian Restaurant Association convention. He appeared on television programs for the *Detroit News* in Detroit and for the Canadian Broadcasting Corporation in Toronto.

Appendix "A"***Report of the Commissioner
of the Northwest Territories*****Meetings of Council**

The Council of the Northwest Territories met three times. The first session was held at Yellowknife from June 25 to 30 inclusive, the second session at Ottawa from December 7 to 12 inclusive, and the third session at Ottawa on February 18.

Legislation

At the first session, fifty-five Bills were passed. Thirty-six Bills involved minor amendments in connection with the consolidation of the territorial ordinances. Seventeen Bills involved substantial amendments to existing ordinances respecting Business Licences, Controverted Elections, Dogs, Fuel Oil Tax, Fur Export, Game, Intestate Succession, Judicature, Legal Profession, Medical Profession, Mining Safety, Motor Vehicles, Municipal Districts, Schools, and Workmen's Compensation. A new Ordinance was passed respecting the establishment of curfew districts. In addition, an ordinance was passed to provide supplementary appropriations for the fiscal year 1953-54.

At the second session, sixteen Bills were passed. Eleven Bills involved substantial amendments to existing ordinances respecting Dental Profession, Fur Export, Game, Interpretation of Ordinances, Liquor, Medical Profession, Motor Vehicles, Municipal Districts, Pharmaceutical Chemists, Protection of Children, and Schools. New ordinances were passed respecting the Devolution of Real Property, and Local Improvement Districts. An ordinance was also passed authorizing the Commissioner to enter into agreements with the Federal Government with respect to vocational training. Ordinances were passed to provide supplementary appropriations for the fiscal year 1953-54 and appropriations for the fiscal year 1954-55.

At the third session one Bill was passed amending the Elections Ordinance to provide for the redistribution of electoral districts. An amendment to the Northwest Territories Act will, upon proclamation, increase from three to four the number of elected members on the Council of the Northwest Territories.

References for Advice

The Commissioner took the opportunity afforded by the Council meetings to seek the advice of members of Council on a number of matters concerning the administration of the Territories.

Civil Service

The Department of Northern Affairs and National Resources continued to provide a Civil Service for the Territories. The Territorial Government, however, reimbursed the Federal Government for the salaries of teachers who taught children other than Indians and Eskimos, and for the salaries of the Superintendent of the Yellowknife Mine Rescue Station, the Edmonton Workmen's Compensation Office, Liquor Superintendent, and Accountant. The administrative work involved was carried on at Ottawa by the Northern Administration Division of the Northern Administration and Lands Branch of the Department, and in the Territories by offices of the Mackenzie District Administrator at Fort Smith and Sub-District Administrators at Yellowknife, Hay River, and Aklavik.

Law and Order

The Royal Canadian Mounted Police maintained law and order throughout the Northwest Territories. The force carried out many administrative functions at points where no departmental representatives were stationed, enforced territorial ordinances, and enforced certain municipal by-laws in Yellowknife and Hay River.

Workmen's Compensation

The revised Workmen's Compensation scheme which came into force on January 1, 1953, was operated successfully during the first calendar year. Basically, it is a scheme making it compulsory for employers to carry liability insurance, and it is administered from a Workmen's Compensation office in Edmonton operated jointly with the Yukon Territorial Government. The Alberta Workmen's Compensation Board, which acts as referee, adjudicates all claims involving permanent disability as well as others which are referred to it by the Commissioner.

During the calendar year 1953, a total of 586 accidents were reported in the Northwest Territories. This total was made up of the following: non-compensable accidents, 374; accidents involving temporary disability, 203; accidents involving permanent disability, 6; and fatal accidents, 3. Total compensation payments for the year amounted to \$33,282.94 and medical costs amounted to \$27,333.72. Thirteen claims were referred to the referee.

The cost of administering the scheme is recovered by assessing employers a percentage of their payrolls. For the calendar year 1953 the rate of assessment was set at one-half of one per cent for non-exempt employers and one-quarter of one per cent for employers who were exempted from the compulsory insurance requirements of the ordinance because their workmen were covered by some other satisfactory scheme.

The Northwest Territories Government's share of the cost of operating the Edmonton office amounted to \$5,741.27. This amount does not include the referee's fees which are not yet known. Assessments collected amount to about \$33,800. In view of this, the rate of assessment for the calendar year 1954 was reduced by one-half, to one-quarter of one per cent for non-exempt employers, and one-eighth of one per cent for exempt employers.

Health

Eleven hospitals were operated in the Northwest Territories during 1953, eight by Missions of the Roman Catholic Church and the Church of England in Canada, one by a mining company at Port Radium, one by an oil company at Norman Wells, and one by a locally elected hospital board at Yellowknife. In addition, six nursing stations were operated, three by Indian Health Services of the Department of National Health and Welfare, one by the Roman Catholic Church, one by the Church of England, and one by the Pentecostal Assemblies of Canada. A tuberculosis X-ray survey of residents other than Indian or Eskimo was carried out by Indian Health Services, on behalf of the Territorial Government. Hospitalization and medical care for indigent patients other than Indian and Eskimo were provided by the Territorial Government. In addition, financial assistance was given in aid of the operation of the Yellowknife Red Cross Hospital and in aid of the construction of a Mission Hospital at Aklavik and the renovation of a Nursing Station at Hay River.

The aged and infirm were cared for in mission hospitals and in institutions in Alberta. Hospital care for residents of the Northwest Territories in provincial institutions was provided when required, including free sanatorium treatment for tuberculosis patients, free treatment of venereal disease, and free cancer diagnosis. Insane persons were sent to Provincial Mental Hospitals in Alberta, under an agreement with the Government of that Province.

With financial assistance from the Federal Government, the general health program was expanded in some respects including dental services and research projects. Medical officers of the Department of National Health and Welfare, who provide medical care to Indians and Eskimos in the Northwest Territories, also assisted the Territorial government in matters concerning the health of non-Indian and non-Eskimo residents and in the administration of public health and other relevant ordinances. The Director of Indian Health Services continued to act as Chief Health Officer of the Northwest Territories.

Education

The Department of Northern Affairs and National Resources operated day schools at Aklavik, Fort Smith, Hay River, Fort Resolution, and Fort Simpson and the Territorial Government reimbursed the Department a proportion of the costs based on the number of children, other than Indian or Eskimo, in attendance. A number of welfare teachers were on the staffs of these schools, who, in addition to their normal teaching duties, gave leadership to local activities designed to effect improvements in community life.

Yellowknife Public School District No. 1 operated a modern eleven-classroom elementary and high school. On March 31, 1953, this school had an enrolment of 260 pupils in Grades I to XII. A new four-classroom school of the Yellowknife Roman Catholic Separate School District No. 2 commenced operation in September, 1953. During the previous school year, the pupils of that district attended the public school by arrangement between the Boards of the two school districts. During 1953, grants were made to the public and separate school districts respectively.

A school at Port Radium was operated jointly by the Eldorado Mining and Refining (1944) Limited, and the Administration. At Discovery Yellowknife Mine, 60 miles from the town of Yellowknife, a school was operated by the mine management assisted by a grant from the Administration. Day schools were also operated by the Roman Catholic Mission at Fort Smith and Fort Simpson, and residential schools were operated by the Church of England at Aklavik, and by the Roman Catholic Church at Fort Resolution, Fort Providence, and Aklavik.

The Territorial Government provided for three scholarships totalling \$1,200, to encourage pupils to continue beyond Grade XII, and also three bursaries of \$1,200 each for vocational training of worthy students residing in the Territories. At Fort Smith, classes were conducted in carpentry, automotive mechanics, typewriting, and stenography. A course for nurses' aides was conducted at the Fort Smith Roman Catholic Hospital. At Yellowknife, classes in home economics and night classes for prospective citizens were featured.

Equipment and supplies were provided for a number of schools to assist them in initiating manual training instruction and physical fitness programs. Shipments of films were made on a monthly basis to settlements in the Mackenzie District, and school broadcast programs, prepared by the Canadian Broadcasting Corporation for audiences of school children across Canada, were rebroadcast over the Mackenzie District radio stations. The Territorial Government supplied free correspondence courses to adults upon request.

Liquor

The operation of the Territorial Liquor Stores and the supply of stock was controlled by the Saskatchewan Liquor Board as Liquor Agent for the Northwest Territories Administration.

In 1953-54, 3,755 Class A Annual Permits and 164 Class E Banquet Permits were issued in the Northwest Territories. Issued at Ottawa were 3 Class B Liquor Permits covering Sacramental Wine and 44 Class C Importation Permits.

Liquor sales in the Northwest Territories totalled about 10,657 gallons of spirits, 2,276 gallons of wine, 8,646 gallons of ale and stout, and 72,257 gallons of beer. Importation permits covered 640 gallons of spirits, 104 gallons of wine, and 34,623 gallons of beer.

Arrangements were commenced to put into effect the amendments to the Liquor Ordinance under which the Administration took over direct operation of the liquor system, effective April 1, 1954. Orders were placed for the liquor requirements for the ensuing year.

Game Ordinance and Fur Export Ordinance

The warden service was maintained in the Territories with a Superintendent of Game stationed at Fort Smith, chief wardens located at Fort Smith, Fort Simpson, and Aklavik, and warden establishments maintained at eleven of the principal settlements in the Mackenzie District. In the Coppermine area and in the Keewatin and Franklin Districts, the Royal Canadian Mounted Police acted for the Administration in all matters pertaining to game resources. The Canadian Wildlife Service maintained a staff of five field mammalogists and provided technical and scientific advice.

The predator control program, begun in 1952-53 as part of a co-ordinated program of rabies control undertaken by the Federal and Territorial Governments in co-operation with the Provincial Governments of Saskatchewan and Alberta, was continued as a means of reducing predation upon the caribou and other game.

The fiscal year 1953-54 saw completion of the first phase of trapline registration, namely, the end of the initial five-year program. There was little increase in the total number of lines registered during the year, but adjustments were continued. There are 1,887 trappers within the Mackenzie District, of whom 1,289, or 68 per cent have acquired registered trapping areas. Of the 437 areas registered, 319 are held under individual registration, and 118 are group areas. Potential trapping areas which are reasonably accessible comprise about 386,615 square miles, of which 201,000 square miles, or 52 per cent is now under registration.

Returns from licences issued for any year do not become available until the autumn following the year of issue. Therefore, the following data are for the licence year ended June 30, 1953. The number of pelts taken dropped from 696,245 to 388,653; the total value of pelts decreased from \$1,448,173 to \$877,345. A decided falling off in the number of pelts taken was shown for most of the important fur-bearing species such as white fox, muskrat, squirrel, beaver, and mink. Thus, the take of muskrat dropped from 516,825 in the licence year 1951-52 to 250,367. However, the take of marten and weasel increased.

The general decline in fur prices which was experienced in the previous licence year continued, but the decreases were less marked. The prices received for marten, muskrat, squirrel, and weasel continued to drop while prices for white fox and beaver were slightly better. The full impact of lower prices on the trapper was tempered somewhat by the action of Council in reducing royalties on beaver, fox, and lynx. Nevertheless, with less incentive to trap fur bearers for the sale of their pelts there was a tendency for some groups of natives to rely on relief or to turn their attention more toward hunting and living off the country.

Welfare

Relief assistance was provided for indigents as required. Arrangements were made for the maintenance of neglected, delinquent, and homeless children in foster homes and institutions, both within and outside the Territories. Old Age Assistance and Blind Persons Allowances were granted, under the federal-territorial scheme, to over 70 recipients.

Development Services

Local roads were constructed and maintained in various settlements and financial assistance was given to municipal districts for road construction.

Municipal and Local Improvement Districts

The Municipal Council of Yellowknife was reconstituted to comprise eight elected members presided over by the elected mayor. The former Council (known as Local Trustee Board) consisted of eight members, five of whom were elected and three appointed by the Commissioner. The chairman was one of, and elected by, the members of the Board.

A new ordinance was passed to authorize the Commissioner to establish Local Improvement Districts in areas where the conditions of development were such that they warranted participation by local owners of property in the cost of local improvements. No districts were established.

Financial assistance was given to municipal districts on the basis of the assessed value of property.

Finances

Territorial Revenues for the fiscal year totalled \$743,578.29. The principal revenues were:

Liquor profits	\$295,553 28
Fuel Tax	17,882 54
Fur Export Tax	50,979 10
Payments from Government of Canada under Tax Rental Agreement	267,493 75
Business Licences	4,829 75
Motor Vehicle and Drivers Licences	11,577 47

Territorial Expenditures for the fiscal year totalled \$607,705.47. The principal expenditures were:

Education	\$246,676 59
Health	229,839 58
Welfare	39,512 07
Roads	37,590 92
Aid to Municipalities	19,957 28

At the end of the fiscal year, the Territorial Government owned buildings having a book value of \$55,899.55, held debentures purchased from the Yellowknife Public School District worth \$74,000, held an outstanding loan owed by the Yellowknife Municipal District of \$12,000, and had cash in the Northwest Territories Revenue Account totalling \$923,449.87. Of this last amount \$69,690 was being held as a reserve for hospital construction, and \$97,000 as a reserve for the construction and maintenance of trunk roads. In addition to these reserves, the Territorial Government had a cash surplus free from commitment amounting to \$729,662.53.

A statement of revenues and expenditures for the year as at April 1, 1954 follows:

Credit Balance in Northwest Territories		
Revenue Account, as at April, 1953.....		\$ 787,577 05
Revenue		743,578 29
Expenditure	\$ 607,705 47	
Credit Balance in Northwest Territories Revenue Account at the close of fiscal year 1953-54 (Final)	923,449 87	
	<hr/>	<hr/>
	\$1,531,155 34	\$1,531,155 34
	<hr/>	<hr/>

Appendix "B"**Report of the Commissioner
of Yukon Territory****Meetings of Council**

The Council held three regular meetings during the calendar year 1953 and the first 1954 meeting in March, 1954.

Legislation

The following ordinances were dealt with. First session—April 8-21, 1953: to amend the Gasoline and Diesel Oil Tax Ordinance; to amend the Government Liquor Ordinance; to amend the Yukon Territorial Public Service Ordinance; to empower the Commissioner to authorize the Department of National Revenue to Delete from its Accounts Debts Due and Owing from Certain Persons; to amend the Hospitals Ordinance; to amend the Municipal Ordinance; to amend the Motor Vehicles Ordinance; to amend the Steam Boilers Ordinance; to amend the Workmen's Compensation Ordinance; to amend the Game Ordinance; to amend an Ordinance Empowering the Commissioner of Yukon Territory to Grant a Franchise to Mayo Utilities Limited for the Operation of a Telephone System in the Mayo Area, Y.T.; to amend an Ordinance Granting Permission to the Yukon Brewery (Holding) Company Limited to manufacture, compound and make intoxicating liquors; to ratify the Tax Rental Agreement Between the Government of Canada and the Government of the Yukon Territory; to incorporate the Children's Aid Society of Southern Yukon; for Granting to the Commissioner Certain Sums of Money to Defray the Expenses of the Public Service of the Territory.

At the second session—May 29-30, 1953, the following ordinances were dealt with: to amend the Municipal Ordinance; for Granting to the Commissioner Certain Sums of Money to Defray the Expenses of the Public Service of the Territory.

At the third session—October 28-November 2, 1953, the following ordinances were dealt with: to amend the Motor Vehicles Ordinance; to amend the Workmen's Compensation Ordinance; to amend the Municipal Ordinance; for granting to the Commissioner Certain Sums of Money to Defray the Expenses of the Public Service of the Territory.

At the first session—March 18-29, 1954, the following ordinances were dealt with: respecting scientists and explorers; to make uniform the Law Respecting Assignments of Book Debts; respecting the Legitimation of Children; to authorize the City of Whitehorse to Construct Waterworks and Purification Systems and Sewage Disposal Plants and to Borrow Money Therefor; to amend the Amusement Tax Ordinance; to amend the Motor Vehicles Ordinance; to Provide for Change of Name; to amend the Yukon Game Ordinance; to amend an Ordinance Respecting the Council of the Yukon Territory; to amend the Hours of Labour Ordinance; to amend the Fair Wages Ordinance; for granting to the Commissioner Certain Sums of Money to Defray the Expenses of the Public Service of the Territory; granting a Beer Licence to Gordon Crum and Norman Mytron of Teslin in Yukon Territory.

Public Works

The Territorial Government is responsible for the construction and maintenance of roads, bridges and territorial buildings through the Territorial Engineer.

Road Construction

Construction of an all-weather road 120 miles long to connect Dawson with the Whitehorse-Mayo Road at Stewart Crossing was continued in 1953, with the main crew working from the Stewart River Crossing towards the McQuesten River Crossing, thence to the Clear Creek Crossing and to a point approximately five miles beyond. From this point a right of way was cleared to connect with the old road from Clear Creek to Dawson. At the Dawson end, a private contractor was employed to widen the old road along the Leota, Asbestos, and Flat Creek Bluffs and up Flat Creek Hill. From the top of Flat Creek Hill, a right of way of minimum width of 100 feet was cleared to a point opposite Barlow Lake. For the greater part of the length of this clearing, a partially finished sub-grade was constructed. Very little gravelling has been done on the Dawson end of the road. Some culverts were installed but additional culverts and off-take ditches will be required.

The following is a summary of the work accomplished on this project: 73 miles of clearing—minimum width 100 feet; 39.5 miles of sub-grade, complete with ditching; 43 miles gravelled; 25 miles partially sub-graded; 5 miles of road widened along bluffs; 10 bridge culverts installed; and 50 box and pipe culverts installed.

A bridge over the McQuesten River was damaged severely during the spring run-off and repairs were carried out during August and September.

With the work completed during the 1953 construction season, it was possible for traffic to use the road all winter and for supplies to be hauled to Dawson. Expenditures totalled \$313,496.22.

Road Maintenance

In Dawson District, the Dawson-Boundary road is 60 miles in length, and leads from Dawson to the Alaska Boundary where it connects with the Taylor Highway and thence the Alaska Highway at Tok Junction. The road is only serviceable during the summer months and is used for mining operations and tourist travel. A maintenance crew spent three weeks on this road and left it in very good condition. However, heavy rainfall late in the season made the road almost impassable in several spots and temporary repairs had to be made. Further repairs will be necessary in 1954. A widening and improving program is indicated when funds are available.

In the Whitehorse District, the Atlin road extends from the Alaska Highway at Mile 866 to Atlin in British Columbia, a distance of 59 miles, of which 29 miles lie within Yukon Territory. Maintenance work was carried out at regular intervals, and further work was done on rerouting the road between Miles 6 and 10. Further gravelling and ditching will be required in 1954.

The Tagish road extends from Mile 1 on the Atlin Road to Carcross and is 32 miles long. It was maintained at regular intervals throughout the season. Heavy snowfall during the winter necessitated extra work in connection with snow removal. Gravelling is required between Miles 9 and 13.

The Carcross road extending from Mile 904.5 on the Alaska Highway to Carcross is 32 miles long. Maintenance was carried on during the summer season. During the winter, there were several glaciers quite active, but these were well controlled. Two bridge culverts were installed early in the season to replace those washed out in the spring. Heavy snowfall entailed extra work in connection with snow removal.

The Two-Mile Hill access road from Whitehorse to the Alaska Highway ascends approximately 190 feet in 3,700 feet and the gradient is as high as 12 per cent in one short stretch. Icy conditions cause considerable difficulty each winter. The road was maintained regularly throughout the summer season. A trial treatment of oil was made with little success. Sanding operations were carried out frequently during the winter. The road was surveyed last year and further survey work is planned to find, if possible, a better location in order that a maximum gradient of 3 per cent might be attained.

The Takhini Hot Springs road is six miles in length and branches off the Whitehorse-Mayo Road near Mile 4. The Territorial Government provided \$2,500 to assist in grading and gravelling.

Maintenance work was carried out to a limited extent on the Miles Canyon-Whitehorse Rapids Road, the Fish Lake Road, and the Annie Lake Road.

In the Mayo District a contract was entered into in June, 1953 for maintenance of the following roads by United Keno Hill Mines Limited with funds provided by the Territorial Government: Mayo-Elsa Road, Duncan Creek Road, Keno City and Mackeno Roads; road to Mayo Dam. Considerable glacial action was encountered on some of these roads during the winter season.

The Whitehorse-Mayo Road was maintained by United Keno Hill Mines Limited with funds provided by the Federal Government, the Territorial Government, and the mining company. Expenditure on maintenance throughout the year totalled \$261,000.

Bridges

The Takhini bridge on the old Dawson Trail was removed as the approaches had been washed away and it constituted a hazard to the Takhini bridge on the Whitehorse-Mayo Road.

An inspection of the suspension foot bridge over the Pelly River at Ross River indicated that the cables on one side were too taut while those on the other side had sagged. Arrangements were made to adjust the cables in order to right the bridge.

Ferries

The Dawson ferry was placed at the Stewart Crossing on the Whitehorse-Mayo Road in the spring of 1953 and the ferry *McQuesten* was transferred from the Pelly Crossing to Dawson. A considerable amount of work was done to place the *McQuesten* in good condition.

New Buildings

A building formerly used as a dwelling was purchased with a view to conversion for school purposes at Carcross. Construction was commenced in 1952 and carried on through the winter. The building was finished in September, 1953.

Construction of a one room school and teacher's quarters at Watson Lake was commenced late in the 1953 season and the basement was completed. The remainder of the construction will be carried out in 1954.

Building Maintenance

In Dawson District, the toilets in the Dawson School were moved from the basement to the first floor to achieve better operation. Eight classrooms and the first floor rotunda were painted. Repairs to the sewer line from the liquor store and fire hall were carried out.

In Whitehorse District, the building housing the Territorial Offices was banked for the winter and some roof repairs were carried out. One room of the former public school building on Lambert Street was redecorated for use as a classroom, and toilets were installed. Heating installations in the Whitehorse High School and teacherage were checked and some repair work was done. The roof of the High School developed leakage over the Auditorium area and plans were prepared for repairs during the forthcoming season.

In Mayo District, materials for improvement of the liquor vendor's house at Mayo were purchased but work had to be deferred until 1954. A house was purchased to provide living quarters for the school principal at Mayo.

Education

Because the school year ends June 30, the following report on the operation of public and separate schools in Yukon Territory covers the period September 1, 1952 to June 30, 1953.

There were thirteen schools in operation, with 45 full-time and three part-time teachers employed. The highest number of pupils enrolled was 1,173, and the average daily attendance was 921·98. Enrolment on September 1, 1952 was 1,007, and on September 1, 1953 it was 1,192. A further increase in attendance is expected during the next year.

Accommodation

The new public school in Whitehorse was opened September 2, 1952 with 531 pupils enrolled. Accommodation at first was adequate, but a steady increase in the number of pupils during the year led to projection of plans for additional rooms as early as June, 1953.

In addition to regular classes, departments of Home Economics, Manual Training, and Art were instituted. The provision of the auditorium made possible full programs of physical education in all intermediate and senior grades. The auditorium has been used extensively in the evenings and on Saturdays and Sundays for community activities, including English classes for new Canadians, band concerts, dramatic and choral performances, badminton, and basketball.

A school was opened at Elsa in September, 1952. United Keno Hill Mines provided an excellent school building, with steam heat and all plumbing facilities supplied by the Company. The Territorial Government agreed to furnish the school and to pay the teacher's salary.

During the summer and autumn of 1953 a residential building at Carcross was remodelled for use as a school, with the upstairs being converted into a teacher's apartment. A well was dug and cribbed. A small electric power plant was installed in the basement, but later removed to an outside shed. The classroom is adequate in size for present and probable future enrolment.

Teachers' Applications

The number of teachers' applications decreased during the year, but fortunately all vacancies but one were filled. More applications were received from Saskatchewan than from all other provinces combined. Few high school teachers with outstanding qualifications applied this year for teaching positions in Yukon schools.

The outbreak of poliomyelitis in the Territory during the summer of 1953 resulted in widespread publicity in Canadian newspapers and periodicals and this may have deterred many teachers from coming to Yukon Territory.

Inspection

Three inspection trips were made by the Superintendent to all schools except Kluane Lake and Haines Junction during the school year—in September and October, 1952; in February and March, 1953; and in May, 1953.

In the schools maintained jointly with the Canadian Army in Highway Maintenance Camps at Kluane Lake, Haines Junction, Brooks' Brook, and Swift River, no problems in administration arose. Good standards of education were maintained by competent teachers.

Owing to increased enrolment at Watson Lake School, which is maintained jointly by the Territorial Government and the R.C.A.F., it was necessary to appoint a part-time teacher to assist with the primary grades.

Owing to the work on a new foundation and the remodelling of the heating system, the Dawson Elementary and High School started late in September, 1952. For a short time classes were conducted in the Administration Building.

The year's work was almost completed by June 1, 1953, when the poliomyelitis epidemic forced the closing of all schools in the Territory. All classes were inspected on May 19, 20 and 21, 1953 and found satisfactory. The short school year handicapped greatly the teachers and pupils.

An additional classroom for the intermediate grades of the Mayo Elementary and High School was opened in the I.O.D.E. rooms in October, 1952.

The new Whitehorse Elementary and High School opened September 2, 1952, with 536 pupils enrolled. There were twenty-two full-time teachers and one part-time (art) teacher. By May 31, 1953, enrolment had increased to 550.

Because of the early closing of school in June, no departmental examinations were written by high school pupils, credits given by high school teachers on the year's work being accepted by the Department of Education of British Columbia.

Art exhibits sent to the Toronto National Exhibition by Whitehorse High School pupils won two awards.

Enrolment

An increase from 1,192 to 1,234 pupils occurred between July 1, 1953 and March 31, 1954 in Yukon Territorial schools. Most of the increase involved Whitehorse Public School, Christ the King School, and Watson Lake School. A slight decrease in enrolment was noted in Dawson Public School.

New Schools

With the opening of a new maintenance camp at Mile 1202, Alaska Highway, in July, 1953, the Canadian Army requested that a school be established at Beaver Creek. The Army provided the school building and accommodation for the teacher; the Territorial Government pays the salary of the teacher and provides all classroom necessities. The school was opened on October 1, 1953.

The building of a mill by Mackeno Mines Limited, and the operation of mines by the Mackeno and Bellekeno companies led to much activity in the Keno City district. Families moved in and a request for a school followed during the summer of 1953. Mackeno Mines supplied the school building, as well as heat, light, and water; the Territorial Government purchased a building at Mayo and moved it to Keno to be used as a teacher's residence.

Although only nine pupils are enrolled, the school is an essential factor in this isolated community. With increased activity in the Keno mining area, in all probability enrolment will increase during 1954.

Game

Big Game

Sixty-five non-resident big game hunting licences were issued during the year. Three non-resident spring bear licences were taken out and 2,980 resident hunting licences were sold.

The following game was taken during the 1952 hunting season, not including game taken by trappers.

	Non-resident Hunters	Resident Hunters
Bear	4	34
Grizzly	28	11
Caribou	27	303
Moose	24	42
Sheep	36	14
Goat	8	3
Coyote	—	3
Wolves	1	11

Fur Bearing Animals

Registration of traplines was completed with the final group registration of the Indians at Old Crow and at Fort McPherson, N.W.T. There are now 451 registered traplines, including 390 individual registrations and 61 group registrations.

The following is a summary of the fur-bearing animals taken by trappers in 1953: beaver, 2,202; bear (not specified), 22; coyote, 10; fisher, 42; cross fox, 21; red fox, 37; silver fox, 1; white fox, 46; lynx, 408; mink, 747; marten, 1,923; muskrat, 52,604; otter, 50; weasel, 1,827; wolverine, 80; wolf, 14; and squirrel, 186,345.

Fur prices remained low and many trappers found employment in prospecting, mining and building activities.

Predator Control

The wolf poisoning program commenced in March, 1953, was resumed in March, 1954 in the area southwest of Whitehorse, in the Watson Lake area, and in the Dawson area. Although it is difficult to assess the actual results, since the baits were placed on the frozen lakes where they would be carried off in the spring, indications are that the program will be successful. Poison permits were issued to six guides and three park wardens and a total of 24 wolves and five coyotes were taken.

Angling

A total of 1,638 non-resident and 1,852 resident angling licences were taken out during the year.

Health

The Chief Medical Officer of the Yukon Territory is located at Edmonton, Alberta. Public Health Officers are located at Whitehorse, Mayo, and Dawson.

A public health nurse is employed by the Territorial Government, with headquarters at Whitehorse. She makes regular visits to Mayo, Dawson, and Carmacks, and to all points along the Alaska Highway within the Territory. Well-baby clinics and examinations of school children are conducted and the nurse assists with the tuberculosis and venereal disease control programs.

A poliomyelitis epidemic in the late spring and early summer months resulted in nine deaths out of 147 reported cases. Twenty-five post-polio patients were transferred to hospitals in the provinces for rehabilitation care.

The annual X-ray survey was interrupted by the epidemic but a total of 2,175 chest X-rays were taken.

The Territorial Sanitary Inspector carried out regular inspections of restaurants, hotels and other public places in Whitehorse, Mayo, and Dawson, as well as along the Alaska Highway.

Grants to hospitals totalled \$61,241.20, including \$32,924 to the Whitehorse Hospital, \$15,498 to the Dawson hospital, and \$12,819.20 to the Mayo Hospital.

Vital Statistics

There were 452 births, 109 marriages, and 118 deaths recorded in the Territory during the year under review. Of these, 378 births, 100 marriages, and 83 deaths were recorded for persons of white status, the remainder being of Indian status.

Social Assistance

Social assistance was provided to those requiring it. Orphaned and neglected children were maintained in school and other institutions at the expense of the Territorial Government.

Old Age Assistance and Blind Persons Allowances were provided in co-operation with the Federal Department of National Health and Welfare and supplementary allowances were provided in needed cases among those in receipt of Old Age Pensions.

Motor Vehicles

There were 2,858 motor vehicles registered on January 1, 1954, including 1,412 passenger cars, 1,131 trucks, 17 buses, and 298 other vehicles.

In accordance with the terms of the Motor Vehicles Ordinance, the owners of vehicles were required to produce certificates of insurance in order to obtain vehicle licences.

Workmen's Compensation

In conjunction with the Northwest Territories Administration, an office was maintained in Edmonton to administer the Workmen's Compensation Ordinance and to afford liaison with the Alberta Workmen's Compensation Board which acts as Referee under the Ordinance. The workmen's compensation officer visited Whitehorse, Mayo, and Dawson in August for discussion with Territorial officials, employers, insurance agents, and others.

Territorial Treasurer

The following table indicates comparison between revenue and expenditures for the fiscal years 1952-53 and 1953-54:

	1952-53	1953-54	Decrease —
<i>Revenue</i>			
Tax Revenue	323,151 75	359,361 93	36,210 18
Licence Revenue	97,551 40	111,678 90	14,127 50
Fee Revenue	139,214 25	193,572 57	54,358 32
Fines	12,238 47	7,304 80	4,933 67—
Miscellaneous Revenue	8,826 20	1,494 73	7,331 47—
Collections applicable Previous Years			
Expenditure	8,521 01	7,404 51	1,116 50—
Subsidy and other Revenue	951,475 97	1,334,818 42	383,342 45
	\$1,540,979 05	2,015,635 86	474,656 81
<i>Expenditure</i>			
<i>Administration:</i>			
Legislation	19,363 39	19,894 22	530 83
Administration	76,352 95	75,311 19	1,041 76—
Education	209,088 09	280,864 05	71,775 96
Public Works	4,622 34		4,622 34—
Health	156,137 46	201,756 88	45,619 42
Welfare	67,932 86	55,490 59	12,442 27—
Grants	2,925 00	1,800 00	1,125 00—
Municipal	77,110 59	78,629 43	1,518 84
Game	19,671 14	15,043 48	4,627 66—
General	17,322 89	8,718 48	8,604 41—
	650,526 71	737,508 32	86,981 61
<i>Roads, Bridges and Public Works</i>			
Maintenance	364,572 76	457,797 97	93,225 21
Equipment	5,170 45		5,170 45—
	369,743 21	457,797 97	88,054 76
<i>Capital Account</i>			
Buildings	96,521 61	108,535 05	12,013 44
Furniture and Fixtures		7,334 86	7,334 86
Machinery and Equipment	45,974 38	63,659 68	17,685 30
Road Construction	121,477 16	335,068 61	213,591 45
	263,973 15	514,598 20	250,625 05
Total	\$1,284,243 07	1,709 904 49	425,661 42
Net Transfer to Surplus	\$ 256,735 98	305,731 37	48,995 39



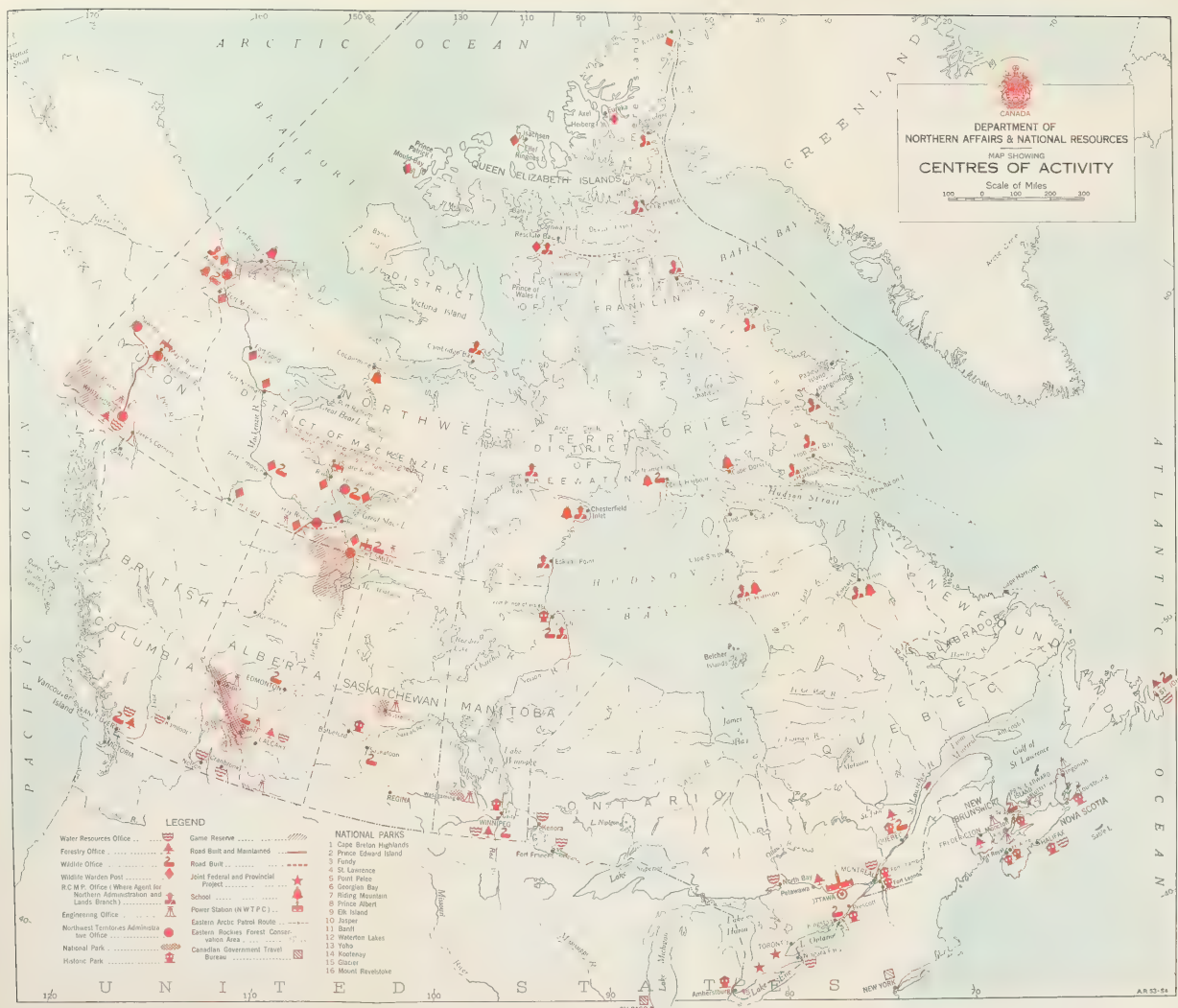
ARCTIC OCEAN

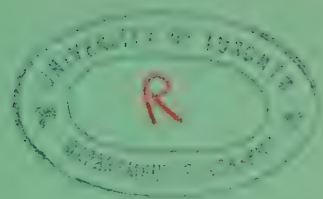


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MAP SHOWING
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Scale of Miles
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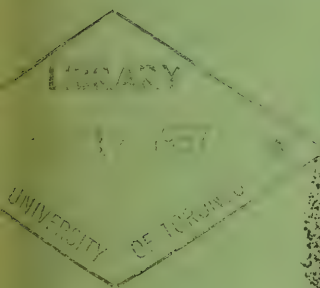


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*To His Excellency the Right Honourable Vincent Massey, C. H.,
Governor General and Commander-in-Chief of Canada.*

MAY IT PLEASE YOUR EXCELLENCY:

The undersigned has the honour to lay before Your Excellency the Annual Report of the Department of Northern Affairs and National Resources for the fiscal year ended March 31, 1956.

Respectfully submitted,

JEAN LESAGE,
*Minister of Northern Affairs and
National Resources*

*The Honourable Jean Lesage, M.P.,
Minister of Northern Affairs and National Resources,
Ottawa.*

SIR:

I have the honour to submit the Third Annual Report of the Department of Northern Affairs and National Resources which covers the fiscal year ended on the 31st of March, 1956.

The Report is prefaced by an article on "Water—A Great Natural Resource".

Your obedient servant,

R. G. ROBERTSON,
Deputy Minister

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Executive AssistantG. A. CODERRE
Private SecretaryDENYS PARE

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Assistant Deputy MinisterC. W. JACKSON
Assistant Deputy MinisterE. A. CÔTÉ
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Forestry Operations DivisionChief—H. W. BEALL
Forest Products Laboratories Division ..Chief—J. H. JENKINS

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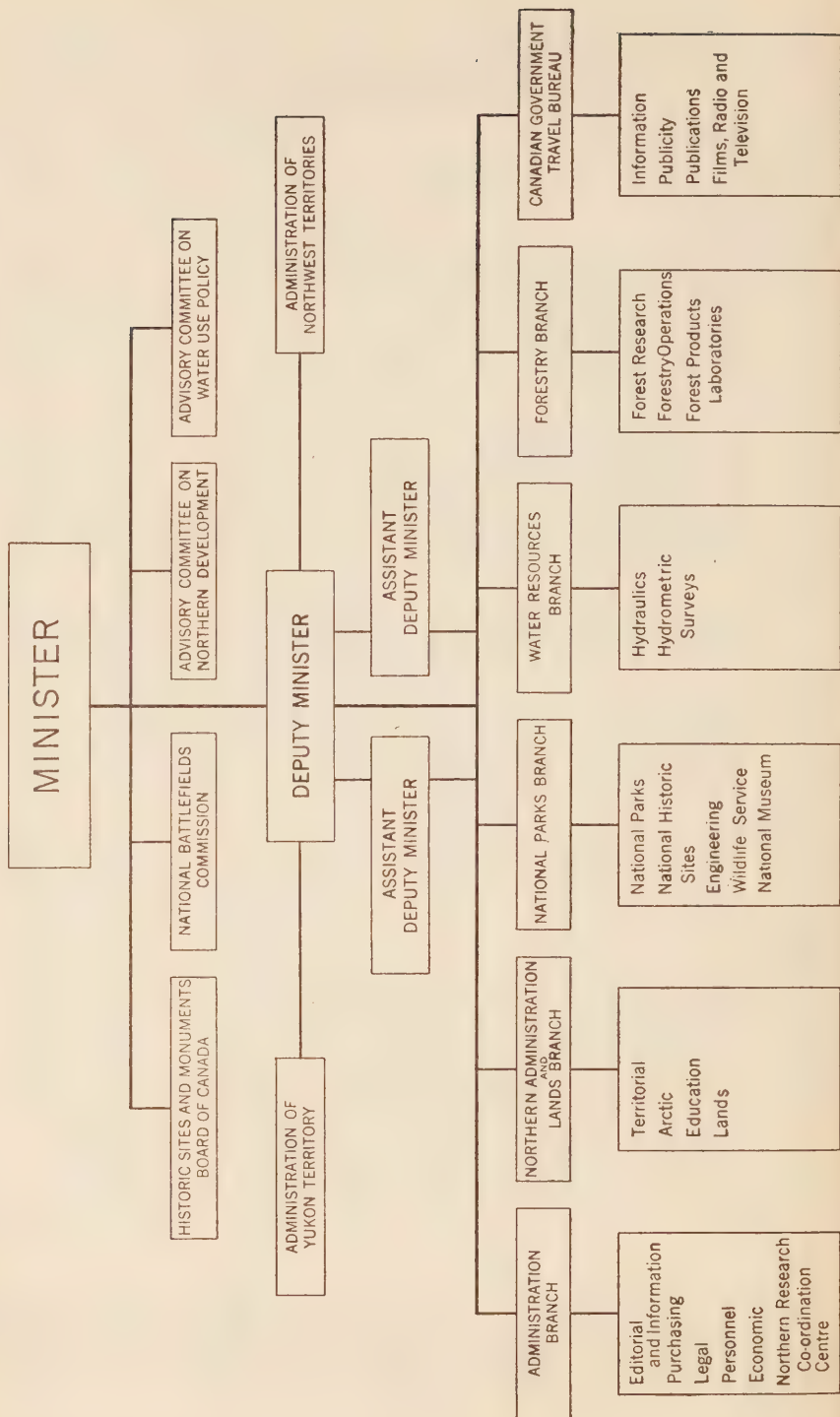
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CONTENTS

SPECIAL ARTICLE	PAGE
Water—A Great Natural Resource	9
ANNUAL REPORT	
Introduction	17
Northern Administration and Lands Branch	20
Territorial Division	21
Arctic Division	24
Education Division	26
Lands Division	27
National Parks Branch	33
National Parks Service	33
National Historic Sites Division	35
Engineering Services Division	35
Canadian Wildlife Service	35
National Museum of Canada	36
Water Resources Branch	39
Hydrometric Services	39
Waterway Problems and Water Power Administration ..	41
Forestry Branch	42
Forest Research Division	44
Forestry Operations Division	45
Forest Products Laboratories Division	48
Canadian Government Travel Bureau	53
Publicity	53
Information and Visual Aids	53
Publications	54
APPENDICES	
Appendix A—Northern Administration and Lands Branch	55
Appendix B—National Parks Branch	59
Appendix C—Water Resources Branch	75
Appendix D—Forestry Branch	81
Appendix E—Canadian Government Travel Bureau	92
Appendix F—Publications	93
Appendix G—Report of the Commissioner, Northwest Territories	101
Appendix H—Report of the Commissioner, Yukon Territory	107

Inserted at the back of this Report is a map showing the location of national and historic parks; game reserves; highway projects; forestry, water resources, wildlife, engineering and Northern Administration offices and posts, and other centres of departmental activity.

DEPARTMENT OF NORTHERN AFFAIRS AND NATIONAL RESOURCES



Water—A Great Natural Resource

From its earliest exploration and settlement onward to our own time Canada has had its economic and social history profoundly influenced by its resources of water. So various and important are its services that what water contributes to our development as a nation and to the living standards we enjoy is beyond measure. Already almost endless, its uses continue to increase as the advance of our society requires that still further demands be made upon it. Dependence upon this country's water resources for our welfare and progress grows accordingly.

Each year about eight thousand billion tons of water fall on Canada as rain or snow. If estimates made in the United States apply also to Canada, then about 70 per cent of this annual precipitation may evaporate or be used by plants, the remainder running off into streams or into the ground-water table. Whether it nourishes the topsoil, adds to the deeper ground-water supplies, or flows into rivers and lakes, water is a versatile servant. The water in our lakes and rivers alone has uses so manifold and diverse that it may justifiably be regarded not just as one but rather as a whole complex of natural resources. Seven per cent, or more than 268,000 square miles, of Canada's surface consists of water; no other country possesses such a large fresh-water area. This surface water has given Canada that master tool of mankind, electricity, which is at once a mainstay of our economy and the efficient servant of our way of life. It provides most of the fresh water essential for the operations of industries great and small. Without it Canada could not have become the highly urbanized country it is today. Lacking surface water, large areas of the Canadian west would not be the thriving agricultural communities which through irrigation they have become. Our water courses provide access to important resources of land, forest, and mine, and continue to play an indispensable rôle in their development. They provide a means for transporting the raw materials and other products of our export trade—the wheat, lumber, newsprint, and minerals—on their way to world markets. They afford passage and environment to many species of fish. Surface water dilutes and carries away much of the sewage and industrial wastes of Canada. Our lakes and rivers beckon us to share the pleasure and recreation they hold out to us.

The growing use of water has been an essential companion of our progress as a nation. How the demand on our water resources has soared may be illustrated first from the requirements of our cities and towns. Little more than half a century ago the population of our urban communities was hardly more than two millions, or less than two-fifths of our total population. Fifty years later, by 1951, Canada's urban dwellers had increased to more than 8,600,000 and constituted 62 per cent of its population. In this time the number of cities having more than 25,000 inhabitants rose from ten to forty-three and their total population multiplied fivefold to 4,650,000. The half-century saw Montreal increase in population from 328,000 to 1,022,000, Toronto from 210,000 to 676,000, Winnipeg from 42,000 to 236,000, and Vancouver from 29,000 to 345,000. As our municipalities have grown their per capita use of water also has expanded, owing in part to the demands of industry.

The raw material most commonly required by industry is water. Upon its availability has rested in no small part the industrial expansion of Canada and all that that has meant for our living standards and for the growth of our population. To achieve a threefold increase in production in less than a generation our manufacturing industries have necessarily increased their use of water tremendously. It is said that a large paper mill may use more water daily than a city of 50,000. The production of one ton of paper may require 50,000 gallons, and the production of one ton of finished steel 65,000 gallons. That this enormous industrial demand is met largely by our rivers and lakes affords one measure of surface water as a natural resource.



Then there is water-power. Sections of the mid-western prairies excepted, nearly every part of Canada is endowed with important water-power resources. The rivers coursing down Rocky Mountain slopes, the rivers and myriad lakes of the vast Canadian Shield, the rapids and falls of the Great Lakes — St. Lawrence River system, these and others are especially rich in such resources. The progress of the Canadian economy has been mirrored in the development that they have undergone for the production of hydro-electricity.

To a remarkable extent the Canadian economy is a hydro-electric economy. Although Canada has less than one per cent of the world's population, it possesses about thirteen per cent of the world's capacity of water-power plants. In installed capacity it ranks second to the United States and on a per capita basis is second to Norway. Of our total capacity for generating electricity, seventeen and one-half million horse-power or about ninety per cent represents hydraulic installations. To serve homes and industry, electricity is transmitted from plants ranging in capacity from a few hundred to more than one million horse-power. Water-power has been the principal source of energy for Canada's rapid industrial development. Indeed, for a significant index of this development we may turn to the expansion undergone by our hydro-power capacity. It has almost tripled in a quarter-century and increased by 70 per cent in the past decade. Twice since 1950 new records have been established for annual additions to this capacity, first with 1,066,000 h.p. in 1952 and then with 1,758,000 h.p. in 1954. Water-power has, for example, provided the low-cost power that is essential for the enormous requirements of the pulp and paper industry, this country's largest manufacturing industry and one of the world's great industrial enterprises. The availability of large blocks of low-cost hydro-electricity also has fostered the establishment of an aluminum industry which manufactures one-quarter of the world's supply of that metal. Altogether, the hydro-electric power consumed in Canada in 1955 is estimated to have represented about 1.1 times the energy derived from coal. In contrast, water-power in the United States furnishes only about one-seventh the energy drawn from coal, while in the world coal provides about sixty times as much energy as hydro-electricity.

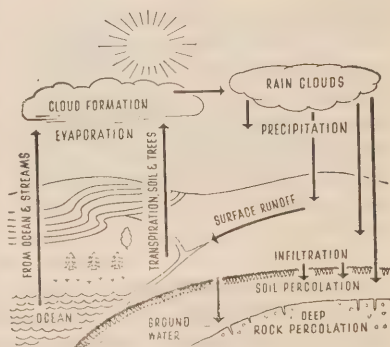
Water-power has encouraged one of the most striking developments of our post-war history—the economic expansion of the Canadian north. Taken to include those parts of Canada which lie well beyond present-day settlement, this north country encompasses much more than half our total area. The search for and discovery of its natural wealth, particularly its minerals, has already focused our attention on many remote regions—Ungava, Yellowknife, Kitimat, Lynn Lake, Beaverlodge, and the like—and has involved the development of important water-power resources. Ahead lies the sure prospect that in areas as far apart as Labrador and the Yukon water-power will foster the creation of great mining and industrial enterprises. It will help to realize the promise of a region which, having a land area of more than two and one-half million square miles, stands out as one of the world's great storehouses of mineral wealth.

The water of rivers and lakes fulfils yet another purpose. In Canada the land nurtured by irrigation runs into many thousands of acres. In Alberta irrigated lands constitute 3 per cent of the total area under crops, whereas the corresponding proportion in British Columbia is no less than one-fifth. Altogether one acre out of every hundred across the country bears its crops with the aid of irrigation. It is, perhaps, not from statistics such as these that the clearest appreciation of irrigation comes, but rather from its crucial importance for areas such as the Okanagan Valley and for farmers of dry prairie lands.

Water Supply a Problem for All Canadians

The vital contribution which our water resources have made to our wealth and welfare in the past will necessarily become larger still if they are to meet the needs of a growing nation. The demand for water rises in proportion to increase in population and industrialization. Because the information available on water use in Canada is meagre, this may be illustrated by reference to the United States. It has been estimated that the volume of surface and ground-water that country requires for municipal and rural use, for industry directly, and for irrigation will have almost doubled between 1950 and 1975, and have multiplied eleven-fold since 1900. In broad outline at least, the picture might be assumed to be similar for Canada.

May Canadians relax in the comfortable belief that the water needed to sustain their nation's growth will surely be available? The answer is all too apparent. Already many municipalities have found it necessary to impose temporary limits on the use of their water supplies. (It is reported that 1,000 cities in the United States restricted the use of water in 1953.) Already some municipalities in southern Ontario must draw their water from as many as a dozen different sources. And already some areas, particularly in southern Ontario, find their industrial growth being limited by water shortages. Concern is also mounting over the fact that in some areas the underground reservoirs which supply water to many



rural and urban users by means of wells have been so depleted as to lower seriously the ground-water table. The problem which water supply has long presented for large sections of the Canadian west is well known. Projected into a future requiring the use of ever more water, these facts serve notice that especially for our most thickly settled areas the availability of adequate water supplies will be a major determinant of continued growth.



It is not only the quantity of water that counts but its quality. In some areas of Canada the pollution of rivers and lakes by municipal sewage and industrial wastes is so marked as to menace health and to limit municipal and industrial expansion. There are densely populated districts which, once adequately served by nearby streams, have since found these waters no longer sufficient in quantity or suitable in quality, requiring that other sources be found at great expense. Most uses of water are affected by pollution. Because many industrial processes require relatively pure water, the lack of it discourages the establishment of new industries and the expansion of existing plants. Waters carrying industrial

pollution can damage the crops they irrigate. Desirable fish do not thrive in heavily polluted water. Outdoor recreation suffers and with it the tourist industry. It is when pollution limits the effective supply of water in areas whose needs already press upon readily available supplies that its consequences are most felt. Since the problem it presents is often greatest where population and industry are concentrated, its significance is mounting for some of the most highly populated parts of Canada. When it restricts the wise and economic use of water, pollution thus can affect our advance as a nation.

How our water resources are to meet growing demands is therefore a question which will become progressively more insistent. Another concern these resources raise is the need for their control. The floods which take life and ravage property have often represented the penalty paid for the removal of soil cover and of other natural barriers to the rapid run-off of water. Instead of a menace these waters could become a benefit where their control and gradual release were found feasible.

The manner in which Canada's water resources are managed will in part determine the extent and character of our future progress and the standards of living of our people. Of what does a program for their wise use, conservation, and control then consist? Such a program requires first a background of physical facts and understanding. It is necessary to know when and how much water is available in a given area.

Consider how important it is that Canada's resources of surface water be assessed. What makes their measurement especially fundamental is the characteristic of surface water of varying constantly in amount. This property of fluctuation—the very word comes from the Latin for wave—is revealed in ever-changing water levels and stream flows. Because the feasibility, the safety, and the cost of most projects for the use of

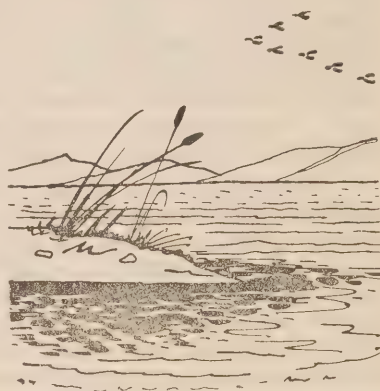
surface water are determined by its available volume, its measurement takes on crucial importance. This factor in an engineer's calculations, more than any other, establishes the horse-power of a projected generator, the dimensions of a canal, and the biological oxygen demand of a sewer out-fall. For these resources to be evaluated with any certainty it is essential that long-term records be obtained from a network of stream-gauging stations set up on rivers and lakes. The location, installation, and operation of these stations, together with the collection, collation, and publication of the information they yield, constitute the chief function of what is known as a "Hydrometric survey." The worth of a hydrometric survey depends on the reliability of its records, and for this no factor is more important than their continuity. Its records are basic to the orderly use and control of surface water.

Canada's Hydrometric Survey

The closing years of the nineteenth century saw the beginnings in Canada of two great water uses—irrigation and hydro-electric development. To be introduced intelligently they required information on the water resources available for them; it was this need which led to the initiation, at first on a small scale, of Canada's hydrometric survey.

The first recorded stream measurement forming part of a hydrometric survey was made in June, 1894, when J. S. Dennis, then Chief Inspector of Surveys for the Department of the Interior, measured the discharge of the Bow River near Calgary. Earlier, Dennis had been sent to the western United States to examine the irrigation systems in operation there and to report on the special legislation and surveys required. His report became the basis of the Northwest Irrigation Act of 1894 and determined the nature and scope of the surveys begun in that year. For more than a decade thereafter general hydrometric work was confined to irrigation surveys undertaken in Saskatchewan and Alberta. Then, in 1908, Parliament made an appropriation of \$10,000 for the establishment of systematic stream measurements, and a "Hydrographic Surveys" section was formed in the Department of the Interior. The Chief Hydrographer stated prophetically that "On the information furnished by the Government on the water supply will depend to a very great extent the development of water-power in Canada".

While the hydrometric survey was becoming established in Alberta and Saskatchewan, other circumstances were bringing about its introduction west of the Rockies. Under the terms of union admitting it into Confederation, the Province of British Columbia conveyed to the Dominion Government a strip of territory more than 500 miles long and 40 miles wide along the prospective route of the Canadian Pacific Railway. By 1911 the administration of water powers and water rights in this Railway Belt and on other Dominion Lands had become so important that a Water Power Branch was formed in the Department of the Interior. This Branch was made responsible for the hydrographic survey



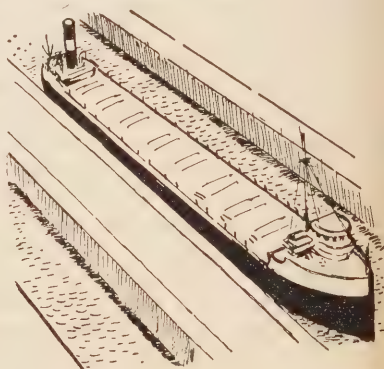
of the Railway Belt and of Manitoba, and also conducted water-power surveys in Alberta and reclamation and water-power investigations in Saskatchewan.



Until 1913 the hydrometric survey operations carried out by the Federal Government were limited to areas in which it had a proprietary interest; that is, in the Prairie Provinces, where waste lands and ungranted lands were reserved (until 1930) to the Crown in the right of Canada, in the Railway Belt, and in the Yukon and Northwest Territories. In 1913, however, the Federal Government entered into a co-operative agreement with the Government of British Columbia, at the latter's request, whereby the surveys already conducted in the Railway Belt would be gradually extended throughout the province. This agreement was the forerunner and the model of corresponding agreements signed with the other provinces. Terminated during the depression of the 1930's, these agreements were afterwards succeeded by individual agreements with each province (Prince Edward Island excepted) for the continuation of a uniform hydrometric survey program by the Federal Government. In 1950 an agreement with Newfoundland extended the survey to that province. The agreement signed in 1919 with Prince Edward Island was later suspended at its request, because its water-power resources are small.

Under the terms of the present co-operative arrangements between the Federal Government and the provinces, the Hydrometric Survey and certain other basic investigations of Canada's water resources are conducted by the Department of Northern Affairs and National Resources under the supervision and direction of the Director of the Water Resources Branch. The Department publishes the records and results of the work it has carried out and makes them available to the provincial authorities. Each provincial government contributes toward the cost of the Hydrometric Survey. It is left with each province to arrange for the detailed water or power investigations required for special purposes connected with the administration or development of its water resources.

The centralized direction and control of the Hydrometric Survey has marked advantages. The logical unit for the investigation and development of water resources is the individual drainage basin. In Canada political divisions do not often coincide with physical divisions, and many important drainage basins extend across interprovincial and/or international boundaries, imposing special responsibilities upon the Federal Government. Under a national hydrometric survey, stream-gauging stations can be established at the most suitable locations without regard to



internal boundaries. Methods of field investigation and of office computation can be standardized from coast to coast. Duplication of survey work by federal and provincial authorities is avoided.

Today the Hydrometric Survey is in operation from Newfoundland to the Yukon Territory. With headquarters at Ottawa, the Water Resources Branch maintains District Offices at Vancouver, Calgary, Winnipeg, Ottawa, Montreal, and Halifax, and sub-offices at a dozen other locations to ensure regional coverage. In 1955 surface water was measured and recorded regularly at more than 1,100 gauging stations across Canada, and engineers of the survey made 5,089 stream discharge measurements. Many gauges are read daily by local citizens, chosen for their personal qualities as well as for their convenience of residence. Their readings are converted to flow figures and then compiled to determine monthly and annual average flows. In key locations, automatic waterstage recorders have replaced the human gauge reader and supply continuous records of water levels.

Much painstaking work goes into the establishment of each gauging station. Regular inspection and maintenance must be carried out. These operations require technical skill and initiative from those in the field, and careful administration in District Offices and at headquarters. Hydrometric surveying is in many cases a pioneer operation, moving ahead of civilization into bush country where boat, pack-horse, dog-team, snow-mobile, aeroplane, and helicopter each have their own special use. Much of the field work must be done in winter, because winter stream-flow is often a limiting factor in the development of water resources and must therefore be recorded.

The history of the Hydrometric Survey is the story of a program which, introduced originally in response to immediate needs, has become an instrument important for Canada's welfare and development. Its services to the nation have mounted as population and industry have expanded; they have grown as our dependence on this country's surface water has increased. Upon the information provided by the survey have relied many programs of local and national significance: water-power development, irrigation and drainage, municipal water supplies, navigation, fisheries, waste disposal, and other forms of public and private endeavour. Thus, the basic data which the survey has provided have contributed, sometimes in large degree, to the development of at least 85 per cent of the enormous water-power capacity now installed across Canada.

The location and evaluation of Canada's water resources is becoming ever more essential to the nation which requires them. The distribution and control of water supplies have become a prime objective of many authorities forced by social and economic needs to practice the management of water resources. This essential work can be carried out most effectively only with the aid of hydrometric records. For Canada, again, the existence of boundary waters and international rivers such as the great Columbia, Yukon, St. Lawrence, and Saint John rivers presents many technical and administrative problems which could not be solved without the knowledge obtained from the Hydrometric Survey.

Conserving Water Resources

Generally speaking, Canada does not yet have the comprehensive knowledge of its water resources that is indispensable for their best use and control. Evidence is accumulating that it requires, in still more

scope and detail, information on the amounts and distribution of precipitation, the flows of rivers, the occurrence of ground water, the quality of waters, the nature of rock and soil formations, and other characteristics of both land and water. This information is mounting in importance as the nation's use of water expands and as water conservation becomes more imperative for a growing proportion of our population and industry. Not only does it lead to better understanding of present problems and warn of the approach of others, but it also suggests how they may best be met. Unless it is available and its lessons applied, a community or an industry may find itself involved in needless expense in the solution of a water problem which otherwise might have been foreseen. This information enters into every stage of the planning, design, construction, and operation of water development projects.

Next after information and understanding, the conservation of Canada's water resources requires planning and programs. Planning for the use and control of these resources must be continuous and flexible enough to accommodate to growth and to changing needs. There can be no single uniform policy applicable to all sections of the country at all times. Rather, the problems associated with water conservation vary from region to region and from province to province, requiring that the measures taken to meet them vary accordingly. In any one location it may be flood control, inadequate domestic or industrial supplies, or stream pollution. It will sometimes be found that water uses are in conflict with each other.

There are today problems of wise use and control of our water resources which call with growing insistence for their solution. One of these is the pollution of rivers and lakes by sewage and industrial wastes. The control of pollution has emerged as an essential part of a broad water conservation program. The nation can ill afford to lose the water which its expansion in population and industry requires. Considering the time needed to install and enlarge facilities for treating sewage and wastes, pollution abatement programs become even more urgent. While the initial cost or corrective and preventive measures sometimes will be great, the ultimate benefit from them will be much larger still. The difficult problems which remain for pollution control can be solved—those arising, for example, in the treatment of the complex industrial wastes of a rapidly advancing technology. Encouragement also comes from the concern of some municipalities and many industries over the pollution problem. The increasing interest in its abatement has led to the creation of provincial and other bodies to work toward its solution. There are also many departments of government, both federal and provincial, which administer acts and regulations having a bearing on this question. Municipal sewage and industrial wastes are basically the responsibility of the province in which they originate.

The conservation of water, as indeed of any natural resource, looks to both the present and the future; it is this characteristic which gives it special significance. In seeing to it that our resources are used wisely and well, we recognize that, however important they may be to us today, they have a still greater rôle to play. Meeting the problems of conserving our water resources is both a challenge and an opportunity measured by the contribution these resources can make to Canada's future.

Annual Report of the Department of Northern Affairs and National Resources

INTRODUCTION

There was much to focus attention on Canada's North and her national resources during the fiscal year 1955-56.

His Excellency the Governor General made the first vice-regal flight to the North Pole during the course of a 12,000-mile tour of the Far North. Modification of Security regulations resulted in visits to DEW Line sites by selected groups.

New and promising mineral prospects of substantial importance were brought to light, and there was great activity in radioactive and base ores. Lithium showings were reported from the area around Great Slave Lake, and the exploration of the Belcher Islands iron occurrences added to the extent of these deposits. More than 17,000 claims were staked, and exploration and development proceeded at a high tempo.

There were promising results from the department's efforts to broaden the basis of subsistence of the Eskimos. Educational facilities were steadily expanded, and handicraft and other local industries were encouraged.

Nearly \$2,000,000 was spent on the construction and maintenance of roads, bridges, and buildings in the Territories, and for work on the re-location of Aklavik in the delta of the Mackenzie River. Lumber operations were begun on a large scale in Wood Buffalo Park. Forest fires in the Yukon and Northwest Territories were more numerous than last year, but the area burned over was considerably less than in 1954.

The number of visitors to the National Parks continued to rise and exceeded last year's record figure by nearly 9 per cent. Maintenance of present travel, recreational, and living facilities, and the provision of additional facilities to meet the increasing travel pressure absorbed a growing part of the appropriations provided by Parliament.

More than 70,000 birds were banded in the course of studies by wildlife officers, which included co-operative annual surveys of water-fowl across Canada. Special attention was given to the barren-ground caribou, fur-bearers, musk-ox, eider ducks, and whooping cranes in the Territories, and to big-game animals and fish in the national parks. Archæological finds related to Early Man in America, made in 1954, were further investigated, and parties from the National Museum were also engaged on other archæological as well as ethnological, zoological, and botanical studies.

On rivers subject to floods, continuous records of river levels were obtained, and a flood warning service was provided. Run-off was slightly above normal across Canada, with flow conditions generally high in the Prairies and parts of British Columbia, but below normal in the

greater part of the eastern provinces. The installed capacity in hydro-electric plants moved up 5 per cent last year with a promise of continued increase in new installations.

The significant part that research plays in the development of Canada's forest resources was emphasized by the inauguration during the year of a program of building to provide up-to-date research facilities. Forest industries continued to maintain a high level of production, and exports of forest products were up 10 per cent over last year. Forest inventories on the average were about 82 per cent completed. Agreements with the provinces in this field and for the fight against the spruce budworm in New Brunswick were extended.

Tourist travel revenues were up 9 per cent over last year, and border crossings, including commuter travel, increased by 7 per cent. United States tourists spent more than three hundred million dollars on Canadian vacations, but Canadians travelling south of the border outspent their neighbours by 45 per cent.

The following table gives a summary of revenues and expenditures for the fiscal year:

	Revenues	Expenditures ¹
<i>Administrative Offices</i>	\$ 76.08	\$ 506,906.79
<i>Northern Research Co-ordination Centre</i>	-	38,073.09
<i>National Parks Branch—</i>		
Branch Administration	-	82,135.81
National Parks and Historic Sites	1,265,224.55	9,304,249.76
Grant to Jack Miner Migratory Bird Foundation	-	5,000.00
Special Grant to the Antiquarian and Numismatic Society	-	15,000.00
Grant in aid of the development of the International Peace Garden in Manitoba	-	9,975.59
Contribution to the Women's Wentworth Historical Society	-	1,000.00
National Battlefields Commission	-	149,690.77
Contribution to the David Fife Memorial Society	-	2,000.00
Canadian Wildlife Service	1,266.55	417,466.28
National Museum	6,272.93	333,358.69
	<hr/> \$ 1,272,764.03	<hr/> \$ 10,319,876.90
<i>Engineering and Water Resources Branch²—</i>		
Branch Administration	-	51,378.21
Water Resources Division	186,246.29	1,795,848.64
Engineering and Architectural Division ..	-	291,939.34
	<hr/> 186,246.29	<hr/> 2,139,166.19

¹Expenditures include gratuities to families of deceased employees, \$8.33.

²The Branch's responsibility for engineering and architectural work ceased on August 31, 1955.

Northern Administration and Lands Branch—

	<i>Revenues</i>	<i>Expenditures¹</i>
Branch Administration	-	149,950.66
Lands Division	1,532,841.09	492,876.58
Northern Administration Division	128,794.88	5,966,828.40
	<u>1,661,635.97</u>	<u>6,609,655.64</u>

Forestry Branch—

Branch Administration	-	95,957.52
Forest Research Division	35,871.36	1,061,212.60
Forestry Operations Division	585.37	1,635,327.45
Forest Products Laboratories Division	4,132.45	636,292.13
Grant to Canadian Forestry Association ..	-	10,000.00
Grant to Pulp and Paper Research Institute	-	100,000.00
Eastern Rockies Forest Conservation Board	-	5,184.97
	<u>40,589.18</u>	<u>3,543,974.67</u>

<i>Canadian Government Travel Bureau</i>	<i>4.73</i>	<i>1,458,251.99</i>
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TOTALS FOR DEPARTMENT	\$ 3,161,316.28	\$ 24,615,905.27
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Northern Administration and Lands Branch

The Northern Administration and Lands Branch administers Eskimo affairs and natural resources in the Yukon and in the Northwest Territories, and manages certain Crown lands and mineral rights in the provinces.

It administers the Northwest Territories under the Northwest Territories Act (R.S.C. 1952). Since there is no Territorial Civil Service, it performs all administrative functions. The Annual Report of the Commissioner of the Northwest Territories appears as Appendix G.

The Branch also administers the Yukon Territory under the Yukon Act (R.S.C. 1952). A Territorial Civil Service under the Commissioner of the Territory performs the administrative functions. The Annual Report of the Commissioner of the Yukon Territory appears as Appendix H.

During most of 1955 the Branch was made up of four Divisions: Administration, Territorial, Lands, and Arctic, but because of the expansion in the educational work a new Education Division was formed and became effective September 1, 1955. The transfer to the Department of Public Works of most of the functions of the Engineering and Architectural Branch of the department necessitated a re-organization of the Branch Engineering Section, formerly under the Territorial Division, and now reconstituted as the Branch Engineering Section under the Director. Offices are maintained at Ottawa, Edmonton, Fort Smith, Yellowknife, Hay River, Aklavik, Whitehorse, Mayo, and Dawson. Summary reports of the work of the various divisions follow.

Branch Engineering

In August 1955, the engineering and construction requirements of the branch were made the responsibility of a new unit, responsible to the Director, to be known as Branch Engineering. This unit took over the responsibilities of the Engineering Project Section of the Territorial Division and also the administration of engineering, architectural, and construction work in the Northwest Territories and Yukon, work formerly done for the branch by the Engineering and Architectural Division of the Engineering and Water Resources Branch of the Department. Branch Engineering consists of a head office staff of ten, with field engineers stationed at Fort Smith, N.W.T., and Whitehorse, Y.T., and a Technical Officer at Yellowknife, N.W.T., on a continuing basis. In addition, head office personnel make the necessary field trips to supervise construction and make inspections. The work of the unit is handled under three headings, namely, Northwest Territories including Arctic; Yukon Territory; and Aklavik Relocation. Details of the work of these three sections during the year are set out below:

Northwest Territories Including Arctic—Road maintenance in the Northwest Territories amounted to \$97,000, of which \$66,300 was expended for the maintenance of the road between the Alberta boundary and Hay

River. A sum of \$28,000 was spent for the investigation and construction of bridges. On the survey of a proposed road between the Mackenzie Highway and Mills Lake \$33,000 was expended.

The construction program included the erection of a two-classroom addition and a new heating system to the present school at Chesterfield Inlet, a combination garage-workshop, a two-classroom day school, a power house, and seven Eskimo houses at Frobisher Bay; a one-classroom addition to the present school at Fort Simpson, and the construction of several smaller buildings throughout the Territories. Materials were purchased for nine Pan-Abode houses for Fort Churchill. The total cost of the building construction program, including improvements to existing buildings, amounted to \$356,017.

Yukon Territory—The cost of buildings erected in the Yukon Territory, including two double houses and five double garages, was \$76,500. Cost of maintenance of buildings and works was \$21,000. Work began on two steel highway bridges, one over the Yukon River at Whitehorse and the other over the Takhini River on the Whitehorse-Mayo Road. Site investigations were carried out for the proposed bridge over the Mayo River. The total expenditure for bridges was \$323,900. The Department paid one-half the maintenance cost of the Whitehorse-Mayo Road, \$130,500; resurfaced a section of the road at a cost of \$20,000; contributed \$60,000 toward the cost of the Stewart Crossing-Dawson Road; spent \$15,000 for maintenance on the Atlin Road; contributed \$2,500 to maintenance of a section of the Canol Road, and \$150,000 for the relocation and construction of the Elsa-Keno Road. The Department also contributed \$18,300 to the Territorial Government toward the cost of school facilities at Whitehorse.

Aklavik Relocation—Detailed investigations and preliminary construction were carried out in 1955-56 at the new site of Aklavik on the East Channel in the Mackenzie Delta. Construction expenditure totalled \$646,000.

Eleven cabins and a garage workshop were constructed, except for application of siding and some interior finish and painting. Two and a half miles of road on the townsite was completed using local gravel fill. A small force of skilled labour was flown in from Edmonton; local labour completed the force.

Consulting engineers placed a party in the field at the site between June 15 and August 15, and submitted reports with a town plan, detailed recommendations regarding utilities, and soil investigation data.

Following the recommendation of Consulting Engineers to use piling as foundation, a method of pile driving suitable for production-line operation was developed, and 200 piles were placed for foundations of houses to be constructed in the following season.

Territorial Division

Territorial Secretariat Section

Administration of the Northwest Territories—The Deputy Minister of Northern Affairs and National Resources is the Commissioner of the Northwest Territories. He administers the Territories under instructions from the Governor-in-Council or the Minister of the Department. A

Council of five members appointed by the Federal Government and four elected representatives from the District of Mackenzie has legislative powers similar to those of a province, except in respect of natural resources. The Northwest Territories' seat of government is Ottawa, but the Council meets once each year in the Territories. During the year the Council met twice, once at Fort Smith, from August 29 to September 8, inclusive, and once in Ottawa, from January 16 to 23, inclusive. The last election was held in 1954.

There is no territorial civil service, other than the liquor system staff, and the administrative functions are carried out by officers of the Northern Administration and Lands Branch. The Territorial Secretariat Section of the Territorial Division is responsible for the administration of legislation and policies of the Council of the Northwest Territories relating to health, welfare, labour, municipal affairs, liquor, professional and business licensing, motor vehicle control, taxation, and Workmen's Compensation. As Secretariat to the Council, it is responsible, in collaboration with the Legal Division, for the preparation of proposed legislation of explanatory notes, references for advice, reports on matters pertaining to the business of the Council, and financial statements for the Government of the Northwest Territories. The activities of the Territorial Government during the year are set out in the Annual Report of the Commissioner, Appendix G.

Administration of the Yukon Territory—The Yukon Territory is administered by a Commissioner who is an officer of the Northern Administration and Lands Branch and is appointed by the Governor-in-Council. A parallel position held by the same official is that of controller, which is a Civil Service appointment. The Commissioner acts under instructions from the Governor-in-Council or the Minister of the Department. A Council of five elected representatives, one for each constituency into which the Territory is divided, has legislative powers similar to those of a province, except in respect of natural resources. The last election was held in the autumn of 1955. The seat of government of the Yukon Territory is Whitehorse, where the Council met during the year on three occasions: two regular meetings and one special meeting to deal with emergent legislation.

With a view to achieving uniformity in the two territories, the Territorial Secretariat Section reviews Yukon legislation and policies, and acts in an advisory capacity on matters relating thereto. The administrative functions of the Government of the Yukon Territory are carried out by a Territorial Civil Service. The activities of the Territorial Government during the year are set out in the Annual Report of the Commissioner, Appendix H.

Forests and Game Section

The Forests and Game Section of the Territorial Division is responsible for conserving and protecting the forests in the Yukon and Northwest Territories, for managing Wood Buffalo National Park, and for administering the game resources of the Northwest Territories on behalf of the Territorial Government. The Section is responsible for the administration of the territorial ordinances respecting game, forest fire protection, and fur export.

The Warden Service in the Northwest Territories is maintained by the Federal Government. It administers the wildlife resources on behalf of the Territorial Government and the forest resources which are a federal responsibility. Under the District Administrator at Fort Smith are a Superintendent of Game, two chief wardens situated at Fort Smith and Aklavik, and wardens and patrolmen at Aklavik, Fort Good Hope, Fort Norman, Fort Simpson, Hay River, Fort McPherson, Fort Resolution, Rae, and Fort Smith. A forest engineer and a fire suppression officer are stationed at Fort Smith.

The Northwest Territories Council at its last meeting altered the boundary of the Thelon Game Sanctuary, thereby releasing 5,888 square miles from the southwestern part. This area was opened to allow exploration for minerals. Council also increased marten quotas in all areas.

The fire suppression and patrol equipment at the warden stations was improved and additional equipment supplied. Two steel fire towers were purchased for erection in Wood Buffalo National Park, where, under the jurisdiction of the Department, the greatest concentration of commercial timber exists. Additional patrol cabins were constructed. Aircraft under contract were available to the forest officials for the protection of forests from fire. A helicopter was hired for use on one fire in an area not readily accessible by other means.

During the 1955 fire season, small standby suppression crews were stationed at Fort Smith and Yellowknife. At Fort Smith there is a well-equipped depot for repair of fire-fighting equipment, motor vehicles, boats, and outboard motors.

An intensive campaign to educate the public to the hazards of forest fires was carried out by the wide use of films, signs, lectures, and radio announcements, as well as by newspaper advertisements.

The annual reduction of the buffalo herd in Wood Buffalo National Park was carried out during January; approximately 200 animals were slaughtered. The meat was retained in the Territories to supply the needs of Indians, Eskimos, and others.

Because of the seriousness of the reported decline in the caribou population, the predator control campaign was greatly intensified. Departmental officers conducted wolf-poisoning operations, and several Eskimos were hired to trap wolves in coastal areas. The Department carried out a program of education for the conservation of caribou.

An increase in the number of pelts taken and a slight increase in prices on some furs, resulted in an improvement in the economic condition of the hunters and trappers.

A total of 141 fires in the Mackenzie District and Wood Buffalo National Park was reported in 1955 against 57 in 1954. Eighty-one fires burned over 193,000 acres and caused total damage of \$296,000. The other 60 fires were in remote areas, where they burned over 200,000 acres. No estimate of damage caused by these fires has been made. Cost of protection was \$141,152.

In the administration of the Yukon's forest resources, the Commissioner of the Territory is assisted by a Forest Engineer in charge of the Warden Service, a Chief Warden and a headquarters staff at Whitehorse, and wardens stationed at Dawson, Mayo, Haines Junction, Kluane, and Teslin. There were 75 fires in the Territory during 1955,

an increase of 18 over the previous year. These fires burned over 41,000 acres and caused damage estimated at \$10,717. Total protection costs for the Territory amounted to \$75,056.

Arctic Division

The Arctic Division administers those areas of the Northwest Territories lying north of the tree-line, including the Arctic Archipelago. It is also responsible for the administration of Eskimo affairs throughout the Canadian Arctic and Sub-Arctic, with the exception only of matters directly pertaining to health and education, which come under the jurisdiction of the Department of National Health and Welfare and the Education Division of Northern Affairs, respectively. Continuing studies are made of the Eskimo economy and welfare, and programs are initiated and developed to meet the rapidly changing conditions in the Arctic and their effects on the native population.

Economic Conditions

Although construction of defence lines, mining, and other developments have had far-reaching effects on parts of the Eskimo population, most Eskimos still rely to a great extent on the country's game and fur resources for their livelihood. The peak of the white fox cycle was passed in the Western Arctic in 1954-55, and a general decline was noted in the number of skins traded throughout the Arctic last year. The muskrat catch in the Mackenzie River delta was again somewhat higher than in the previous year. There has been greater trade interest in white foxes during the past year, and prices have firmed slightly. Muskrat price levels have, however, remained about the same. Wage employment has assisted the Eskimos at the places where it was available, but elsewhere many have had to be given assistance to tide them over a poor fur year.

Consideration is being given continually to means of diversifying and widening the Eskimo economy. In areas where continuing employment is available, Eskimos are being encouraged and assisted to take advantage of it. Educational facilities are being steadily expanded, and technical training is provided for those considered capable of taking up skilled work.

Handicrafts and other local industries are being steadily expanded. Eskimo sculpture and other art objects continue in strong demand. The boat-building projects in both the Eastern and Western Arctic are operating at capacity. Experiments in eider-duck farming and down-collecting were carried out at Payne Bay and Cape Dorset last year with a considerable measure of success, and arrangements are being made to expand the operations at other places where there are large concentrations of eider ducks. In consultation with the Department of Agriculture, experiments are being conducted in the raising of livestock and garden and field crops in the Fort Chimo area of Ungava Bay. In 1955 ten sheep were taken in, and test plots of vegetables, cereals, and grasses were laid out. The initial results have been promising, and arrangements are being made to extend experimental work next year.

At the annual round-ups in 1955 the total count of reindeer in the five herds in the Mackenzie River delta was 6,502 animals, a decrease of 1,231 as compared to the previous year. Losses due to straying, injury, and disease were heavy, and investigations are now being made to determine more accurately the reasons for the decline and the steps that will have to be taken to avoid them in future.

Through the Eskimo Loan Fund and other means, assistance is being continued to those Eskimos who from choice or interest continue to follow the traditional hunting and trapping way of life. Groups that have been assisted to transfer from marginal areas to places where conditions are more favourable continue to do well, and new communities are being gradually established and enlarged as circumstances warrant.

During the year, six Northern Service Officers were appointed to co-ordinate field activities and to supervise developments in various areas. Three were attached to DEW and Mid-Canada Line operations, and three others were located in Keewatin, Ungava Bay, and Frobisher Bay.

A trained welfare officer has also been appointed to the Division to deal specifically with the problems arising from the large number of Eskimos who require rehabilitation and guidance on discharge from hospitals after prolonged treatment.

The Committee on Eskimo Affairs, formed in 1952, and its Subcommittee on Eskimo Education held meetings during the year to consider matters of policy in relation to changing conditions in the Arctic.

Patrols and Inspections

The 1955 annual Eastern Arctic Patrol visited all the main centres in this area on board the C.G.S. "C. D. Howe". Other Arctic areas were covered by airplane at various times during the year. Most Eskimo camps were visited by boat and dog team throughout the year by R.C.M. Police detachments on their regular patrols.

OTHER FEDERAL GOVERNMENT ACTIVITIES IN THE ARCTIC

Department of Fisheries

Studies continue to be made of the fish and marine animals in arctic waters to determine the extent of these resources and the seasonal migrations. The M.V. "Calanus" operated in northern Hudson Bay and Foxe Basin during the past year.

Department of National Health and Welfare

Besides the regular medical work of resident doctors and nurses, tuberculosis surveys were carried out in a number of districts for the purpose of having those infected placed under treatment. Although a number of outbreaks of simple diseases occurred—the result of increased contacts with the outside world—no really serious epidemics took place among the Eskimos during the past year.

Department of Transport

Besides arranging for the supply of other government installations in various parts of the Arctic, this Department again carried out the resupply of the joint Arctic Weather Stations.

Department of Mines and Technical Surveys

To meet the need for precise data for those engaged in Arctic development, extensive geological, hydrographic, and other surveys were again undertaken during the past year.

Department of Justice

The R.C.M. Police continued to assist in the administrative functions of this and other departments and in maintaining law and order in the Arctic. In particular, the various detachments are charged with the administration of relief, family allowances, old age and blind pensions, and assistance, in general, of the Eskimo.

Education Division

The Education Division is responsible for organizing education and vocational training programs for the Northwest Territories, for inspecting all schools in the Territories, and for developing community welfare. The education of the Eskimo population of the Northwest Territories and the coastal region of northern Quebec is also the responsibility of this Division. Although the education of white children and children of mixed blood is the responsibility of the Territorial Government, the Education Division provides the necessary administrative services.

In the field of Eskimo education, the Department operated day schools in the Northwest Territories at Aklavik, Tuktoyaktuk, Coppermine, Chesterfield Inlet, Coral Harbour, Cape Dorset, and Frobisher Bay, and in the Province of Quebec at Port Harrison and Fort Chimo. A school hostel was in operation at Chesterfield Inlet for the accommodation of Eskimo children not resident at the settlement. The hostel was established in conjunction with the local Federal School and was operated by the Roman Catholic Mission. At Coppermine a school tent-hostel for Eskimo children of the surrounding area was operated by the Anglican Mission in conjunction with the local Federal School.

By special arrangement with the Territorial Government the Department operated day schools in the Mackenzie District for non-Indian children at Fort Smith, Hay River, Fort Resolution, and Fort Simpson, and, in addition, provided for the education of non-Indian children in the federally-operated schools at Arctic Red River, Fort Good Hope, Fort McPherson, Fort Norman, Rae, and Rocher River. Welfare teachers on the staffs of these schools gave leadership to local community activities.

Arrangements were made with the Indian Affairs Branch of the Department of Citizenship and Immigration, whereby, effective April 1, 1955, the Department of Northern Affairs and National Resources assumed responsibility for the education of Indians in the Northwest Territories. The result was that all schools operated formerly by the Indian Affairs Branch in the Mackenzie District were taken over by the Department. These schools are located at Arctic Red River, Fort Franklin, Fort Good Hope, Fort McPherson, Fort Norman, Rae, Rocher River, Jean Marie River, and Fort Liard. A summer school for Indians was conducted at Lac la Martre. The Department continued the arrangements formerly entered into by the Indian Affairs Branch for the maintenance and education of Indian children in the Anglican and Roman Catholic Residential Schools at Aklavik, and in the Roman Catholic Residential Schools

at Fort Providence and Fort Resolution. In addition, effective April 1, the Department assumed responsibility for the education of Indian children in attendance at the Roman Catholic Mission Schools at Fort Smith and Fort Simpson.

The Department provided one teacher each for patients in St. Anne's Hospital at Fort Smith, St. Joseph's Hospital at Fort Resolution, St. Margaret's Hospital at Fort Simpson, and All Saints' Anglican Hospital at Aklavik.

Arrangements were continued for the maintenance and education of Eskimo children in the Anglican and Roman Catholic Residential Schools at Aklavik, N.W.T., and Fort George, Que. In a number of settlements in Eskimo territory, part-time schools were operated by missions of the Anglican and Roman Catholic churches. A part-time school was also conducted by the Canadian Interior Mission at Maguse River. Part-time schools received assistance from the Federal Government in the form of grants and school supplies.

The curriculum prescribed by the Alberta Department of Education is being followed for the time being in the schools of the Mackenzie District. In order to maintain instructional standards, the schools of that district are inspected periodically by a Superintendent of Schools, who has his headquarters at Fort Smith. In the field of vocational training, a program of training suitable for the Northwest Territories is being worked out. The work of implementing the details of this program is the responsibility of the Vocational Training Co-Ordinator, who also has his headquarters at Fort Smith.

Northern Administration has under consideration a special curriculum for use in Eskimo schools. Inspection services for these schools, located in the District of Franklin, in the District of Keewatin, in part of the coastal area of the District of Mackenzie, and in northern Quebec, are provided from Ottawa.

During the 1955-56 fiscal year, vocational training was provided for 107 persons through the medium of Local Training Programs, On-the-Job Training, and apprenticeship and other types of vocational training on an individual basis at points outside the Northwest Territories. Indians, Eskimos, and white students alike profited from this training program, which was carried on in 22 vocational fields. The emphasis is on training for employment in jobs available in the Northwest Territories. The program will be expanded and extended as the economy of the area improves and as industrial and other developments take place.

A summer school for teachers of the Mackenzie District was held at Yellowknife from August 22 to September 3. Approximately seventy teachers and instructors attended the two weeks' course. Emphasis was placed on topics of particular significance to the area. Demonstration teaching and workshop discussions characterized the procedure. Teachers' Institutes of two weeks' duration each are being planned for 1956-57 to help teachers in the Eastern and Central Arctic regions.

Lands Division

The Lands Division administers Crown-owned lands, mineral rights, and timber, in the Yukon and Northwest Territories; mineral rights underlying certain lands in the provinces; and public lands brought under the control of the Minister of Northern Affairs and National

Resources by the Public Lands Grants Act, 1950. The Division handles former Dominion Lands records and reviews seed grain, fodder, and relief indebtedness.

The great increase in exploration for uranium and base metal ores in the Yukon and Northwest Territories and the beginning of large-scale timber-cutting operations in Wood Buffalo Park were the outstanding developments during the year.

Mining¹

Northwest Territories

The outstanding feature during the year was the large increase in staking activity which reached an all-time high with a total of 13,456 recorded claims. This staking activity and accompanying exploration took place in ten different localities and was continuing at the end of the year. Staking was done on uranium, copper, lead-zinc, iron, and lithium showings.

From the three producing mines in the Yellowknife Mining District there was a slight increase during the year in the production of gold and a marked increase in the production of silver. The grade of ore mined remained fairly constant, as did the tonnage milled. Ore reserves were increased at all three mines, and development work continued to outline further ore reserves. Experiments were made at one of the mines where difficulties had been encountered in beneficiating the ores, and some success was achieved in recovering some of the values which had been dissipated into the atmosphere. In addition, underground development was conducted at three gold, four uranium, one nickel-copper, and one lead-zinc mine.

Uranium production and leaching the old tailings from previous operations continued at Great Bear Lake. For the first time the values of production of radioactive minerals were released for this operation on the publication of figures for 1954 and 1955.

There was an increase in the amount of exploration and development work done in the Hottah Lake area, and several radioactive discoveries were examined.

During 1955 approximately 2,100 mineral claims were staked on behalf of one company in the Sulphur Bay area northwest of Great Slave Lake. This company already has let contracts for the 1956 season on an extensive diamond drilling program now under way. Scattered occurrences of lead-zinc ore have been found in this area, and it has been established that the area is underlain by the Presquille limestone, which is the same formation in which the lead-zinc ore is found at Pine Point, on the south side of Great Slave Lake.

Another company staked approximately 1,500 claims in two groups to the north and south of the lead-zinc showing at Pine Point. In the Marian River area, staking continued at a high rate until the announcement that adequate supplies of uranium were assured and no special contracts would be let after the 31st of March, 1956.

In the Prelude Lake-Yellowknife Bay area extensive staking was done to cover the known lithium deposits. In the Indian Mountain Lake area the company holding the known lead-zinc deposit was reorganized, and steps were taken to restake the lapsed claims in the vicinity of this deposit.

¹See Appendix A, Nos. 1 and 4.

Interest was shown in the copper deposits in the Coppermine River area, and all the lapsed mineral claims were restaked. Tenders were invited on a 500-square-mile reservation in this area, and the successful tenderer agreed to spend \$900,000 in exploration and development work over the next four years. Several new occurrences were found and staked in this area. At McInnis-Tsu Lake in the Mackenzie District, south of Great Slave Lake, an attractive uranium discovery, made early in the season, sparked a major rush into the area where approximately 2,500 claims were staked.

On the 1st of March, 1956, the boundaries of the Thelon Game Sanctuary were changed. This revision will now permit exploration and prospecting in a potential area of approximately 1,200 square miles easterly from Artillery Lake. The Geological Survey of Canada made a geological reconnaissance of the region in 1955 and found rock structures favourable for the deposition of minerals where the terrain is too rugged and rocky for musk-ox to graze.

Development work continued on the iron deposits located on the Belcher Islands, and late in the season two new anomalies were discovered. These were immediately staked, and a limited amount of diamond drilling was done on them.

The company that performed underground development work on the nickel-copper deposit at Rankin Inlet, on the west shore of Hudson Bay, refinanced at the end of 1955, and has now declared its intention to continue with development work and construction of the mill during the coming year. Some work was performed on the potential iron deposit at Atzinging Lake, east of Great Slave Lake. Additional staking was conducted in this area.

Courses in First Aid and Mine Rescue work were conducted at the Mine Rescue Station at Yellowknife, and competitions were held to select the best rescue team. First Aid teams entered the interprovincial competitions where they attained very high marks as well as one award.

Yukon Territory

Placer gold mining continued to dominate the activity in the Dawson Mining District. The major placer gold producer operated seven dredges and one hydraulic sluice. In addition, three major companies each operated dredges, and five hydraulic properties were active. Placer operations, utilizing bulldozers and sluice boxes, were conducted in the Bonanza, Adams Gulch, Gold Bottom, Last Chance, Hunker, Monte Cristo, Ready Bullion, Caribou, Groetcher Bench, Little Gold Creek, Glacier Creek, Miller Creek, Clear Creek, Henderson Creek, and Scroggie Creek areas. The value of the placer gold produced totalled approximately \$2,500,000, which was an increase over the production in 1954.

In the Mayo Mining District the main producing company continued production of silver-lead-zinc ore. The custom mill at Keno operated for only two months in 1955. Three new discoveries of silver-lead-zinc were made, and 345 quartz claims were recorded.

In the Whitehorse Mining District, exploration and development work continued on lead, zinc, nickel, and copper properties. Underground development on the nickel-copper deposit at Quill Creek continued, and one additional level was established. To test the ore at depth, plans are being made to sink an internal shaft to 600 feet below the present

workings in order to determine if there are sufficient ore reserves to warrant production on a commercial basis. Late in the season a new copper discovery was made in the area just north of the British Columbia-Yukon border in the Watson Lake Area, and major mining companies have acquired claims. Owing to the lateness of the season, however, very little development work was performed, and the potential of the discovery cannot be determined at this time. A total of 2,333 quartz mining claims were recorded in the Whitehorse Mining District during 1955.

Interest was revived in the Whitehorse copper belt because of the increased price of copper, and a few lapsed claims were re-staked.

Production of coal from the Tantalus Butte Mine continued, and further reserves were outlined during the season.

The first claim maps from the new Map Service were produced, and more staking maps will be made available to the public during the coming season.

The asbestos discovery north of Dawson was diamond drilled, and reports are that the company interested is pleased with the results.

Approximately four thousand claims were recorded in the Yukon Territory during the year. Diamond drilling footage increased, and a much greater area was covered by geological, geophysical, and geochemical exploration survey methods.

The Mining Inspector conducted regular inspections on all underground workings in the Territory and also inspected mineral claim staking and surface development work.

Oil and Gas

Northwest Territories and Yukon Territory

During the 1955-56 season, two public competitions were held for the acquisition of 38 exploratory permits in the Northwest Territories; 35 permits were granted as a result of these sales. A total of 91 exploratory permits, covering an area of 5,352,523 acres, was granted during the year. Seven new wells were drilled, one suspended as a gas well, and the remaining six abandoned as dry holes. Twenty-six test holes were also drilled. During the season, 33 members of the Geological Survey were employed in the Northwest Territories on surface mapping with six helicopters. In addition, one geophysical survey was undertaken in the Yukon Territory, and two geophysical surveys were made in the Northwest Territories.

Provinces

During the year six public competitions were held for the purchase of leases of the oil and gas rights underlying 54 parcels of land in Saskatchewan and 32 parcels in Alberta. As a result of these competitions, 26 leases were granted in Saskatchewan and 26 leases in Alberta. One public competition was held for the outright sale of the mineral rights underlying five parcels of land in Ontario.

Royalty was received from six wells in Manitoba completed on Crown leases and from three wells partly owned by the Crown in the same Province.

Lands, Timber, and Grazing¹

Yukon Territory

Although the number of land sales and leases increased approximately 25 per cent, the revenue from this source is slightly lower. The sales in the fiscal year 1955-56 concerned parcels of land along the Alaska Highway and in settlements where land values are lower than those in the Whitehorse area where most of the 1954-55 sales occurred.

The number of unsold Crown lots in the City of Whitehorse is very small. This situation will be remedied in 1956 when approximately 145 lots in the new subdivision on the left bank of the Yukon are offered for sale.

The number of timber permits issued in Yukon Territory was nearly equal to the quantity issued in the previous year, but the volume of timber cut was reduced substantially.

On March 31, 1956, thirty-eight commercial timber berths were in operation.

Northwest Territories

The number of completed land sales decreased markedly during the year. The reason for this is the drop in the number of lots sold in the Municipal District of Yellowknife. There was an increase in the number of leases in force.

Small timber cutting operations were fewer than in the previous year. This was more than offset by a substantial increase in cutting activity in the timber stands of Wood Buffalo Park. On the Peace River, timber is being cut and sawn on one berth comprising 26 square miles. The sawmill on this berth now produces 750,000 ft. b.m. each month, and the output will be increased to 1,000,000 ft. b.m. per month. Timber cutting rights on a second berth in Wood Buffalo Park were disposed of, but woods operations on the 34-square-mile area have not been started. These two berths are expected to produce approximately 12,000,000 ft. b.m. annually, when operations are in full swing.

Twelve commercial timber berths were operated in the Northwest Territories and Wood Buffalo Park on March 31, 1956.

Public Lands in the Provinces

These lands were formerly acquired or reserved for the use of a Federal Government department to fill a specific need. When no longer required they were transferred to this Department for administration. Every opportunity is taken to obtain revenue from these lands, and in due course they are offered for sale. Research to clarify titles is carried out in some cases.

Dominion Lands Records

Under the Natural Resources Agreements with the Western Provinces, the Federal Government became the custodian of records dealing with homestead and other land grants made prior to 1930. Because of the finding of oil and the search for strategic minerals, interest in these records, particularly those concerned with the under-rights, has increased

¹See Appendix A, Nos. 2 and 3.

during the last few years. The homestead entries and applications for Letters Patent also provide acceptable evidence for proof of age for Old Age Pensions.

During the year, 365 drawers of mining lands files were examined, and correspondence containing information of little administrative value was destroyed. Approximately 165 Registers and other records dealing with Homestead Grants, Soldier Grants, and Rebellion losses were transferred to the Public Archives.

Seed Grain, Fodder, and Relief Indebtedness¹

Most advances of seed grain, fodder for animals, and other relief made to settlers and homesteaders in Western Canada between the years 1876 and 1926 have been repaid in full, written off as loss, or settled by adjustment. There were still 4,375 accounts outstanding on March 31, 1956, of which 1,180 were advances made by the Federal Government and 3,195 were advances made jointly with the provincial governments of either Alberta or Saskatchewan.

During the year, 933 accounts were considered by the Seed Grain Advisory Boards, and adjusted settlements were reached. These included the final account in Manitoba. Six accounts were paid in full.

¹See Appendix A, No. 5.

National Parks Branch

The National Parks Branch has five divisions: the National Parks Service, the National Historic Sites Division, the Engineering Services Division, the Canadian Wildlife Service, and the National Museum of Canada. Summary reports of the work of these Divisions follow.

National Parks Service¹

The National Parks Service is responsible for the administration, development, and improvement of the national parks, including the maintenance and operation of park townsites. During the year, improvements were made to camp-grounds, trailer parks, and recreational facilities. A large part of the funds voted by Parliament was used to improve and extend roads, bridges, trails, and telephone lines.

Visitor attendance at the national parks showed a marked increase over the preceding years. Although there was a considerable decline in attendance at Cape Breton Highlands Park because of road construction on a provincial section of the Cabot Trail, substantial increases were recorded at most of the other national parks. Banff, Jasper, Point Pelee, and Riding Mountain Parks recorded the greatest increases in attendance. Banff attracted a record number of over 700,000 visitors.

Work continued on highway and trail construction programs. Considerable progress was made in the construction of the Trans-Canada Highway through Banff and Yoho Parks, and in the reconstruction of the Banff-Jasper Highway.

Several motel, hotel, and bungalow cabin units were erected by private enterprise. In Banff Park a 47-unit motel was completed, and a 33-room lodge at the foot of Mount Norquay was opened for business.

The National Parks Service carried out improvements to camp-grounds and picnic facilities. In Banff Park, considerable progress was made on the extension of the trailer park at Tunnel Mountain, which will accommodate 264 trailers when completed. A new consolidated camp-ground area at Point Pelee Park, covering an area of about 10 acres, was opened on May 1st. In this area 15 trailers and 125 campers can be accommodated, and the facilities include kitchen shelters, comfort stations, laundry facilities, and electric power.

Recreational facilities provided by the National Parks Service continued to be well patronized by visitors. At the Upper Hot Springs Pool in Banff Park, attendance reached 145,782 during the fiscal year, compared to 141,957 for the same period last year. At the Cave and Basin in Banff, attendance was 121,721 from May to September, compared to 98,720 for the same period in the previous year. Approximately 40,000 persons utilized the Miette Hot Springs in Jasper Park during the summer season, compared to 24,645 last year. Gratifying increases were also reflected in the attendance records for the Aquacourt at Radium Hot Springs in Kootenay Park and at the outdoor pool in Jasper Townsite.

In Banff Park, work was commenced on a new ski jump at Mount Norquay, which is being built to meet Olympic and FIS standards.

¹See Appendix B, Nos. 1 to 4, 8 to 11.

Golf, bowling, and tennis tournaments were held in Prince Albert and Riding Mountain Parks. In Banff Park, the annual Banff Indian Days celebrations were held from July 21 to 24, and several winter sports events took place, including the International Collegiate Ski Meet, the Annual Banff Bonspiel, the Alberta Interscholastic Ski Meet, and the Banff Winter Carnival.

At Cuthead Creek, in Banff Park, a Park Wardens' Training School, held from May 26 to June 8, was attended by 19 wardens, and two courses were given, each with an attendance of 24, from October 17 to 29 at a Mountain Rescue and Climbing School. A Winter Ski and Rescue School was held in Banff Park from February 1 to 24. A total of 40 wardens from the mountain parks attended, as well as representatives of the Royal Canadian Mounted Police. In Jasper a Park Wardens' Training School and a Rock-Climbing School were held.

The automatic telephone systems, installed by the Alberta Government Telephones in Banff and Jasper, were put into operation in October. A new telephone line was installed from Jasper townsite to the East Gate. A representative of the National Research Council carried out a survey in Banff Park to investigate the use of V.H.F. radio for park purposes.

Fire danger stations were kept in operation during the fire season in Banff, Jasper, Yoho, Waterton Lakes, Prince Albert, Riding Mountain, Fundy, and Cape Breton Highlands National Parks. The fire loss, after making allowance for the salvage of fire-killed timber, was \$54,767.80. Total forest fire protection costs were \$373,210. Smokers and campfires caused 20 of the 43 fires or 46.5 per cent. Lightning was responsible for 16 fires or 37 per cent. The remaining seven fires were caused from slash burning on highway construction and other park operations.

Inspections of forest insect and disease conditions in the National Parks were carried out by specialists of the Forest Insect and Disease Survey of the Department of Agriculture. Liaison was maintained with the Forest Biology Division of the Department of Agriculture concerning the current status and possible control measures of forest insect and disease infestations in the National Parks.

Heavy snow falls in the late spring of 1955 in Jasper and Prince Albert National Parks and a severe windstorm in Mount Revelstoke National Park in June caused extensive damage to timber stands in these parks.

To conserve grazing areas, overabundant mammalian populations were reduced in Banff, Jasper, and Elk Island National Parks. During the fiscal year, 507 buffalo, 227 elk, and 24 moose were killed, and the meat and hides sold by tender or donated to the Indian Affairs Branch. The beaver population in Prince Albert Park was reduced by 2,415, and at Point Pelee 7,000 muskrat were trapped and pelted.

More than 426,000 trout of various species raised in park hatcheries were distributed in mountain park waters. Salmon and brook trout released in waters of Cape Breton Highlands Park were supplied by the Department of Fisheries. Clear Lake, Riding Mountain National Park, was stocked with pickerel supplied by the Manitoba Fisheries Branch and the Ontario Fish and Wildlife Division. Trout eggs were donated to the National Parks Service by the Manitoba Fisheries Branch and the British Columbia Game Commission. The National Parks hatcheries supplied trout eggs to biologists of the Province of Quebec and the State of Pennsylvania for research purposes.

National Historic Sites Division¹

The National Historic Sites Division is responsible for the operation and maintenance of 13 national historic parks and for the care and preservation of more than 500 historic sites, which have been erected throughout Canada. The Historic Sites and Monuments Board of Canada, an honorary body consisting mostly of historians representing each province, advises the Minister on the marking of sites of national historic importance. In the fiscal year, work was completed on the Alexander Graham Bell Museum building at Baddeck, N.S.

Engineering Services Division²

This Division, though officially created on April 1, 1956, to undertake the work previously done for this Branch by the Engineering and Architectural Division of the Water Resources Branch, actually assumed its new duties as of September 1, 1955. The Division also operates as a servicing unit to other divisions of the National Parks Branch.

The Division comprises a head office at Ottawa with district offices at Banff, Alta., and Halifax, N.S. Each district office is in charge of a supervising engineer. In addition, resident engineers are posted to the headquarters of the larger national parks. Although directly responsible to the park superintendent, they look to the supervising engineer for professional and technical assistance.

Professional and technical staff are engaged in field surveys, investigations, inspections, and professional supervision of construction projects; in preparation of plans, bills of materials, and estimates of cost of roads and bridges, as well as water, sewer, and drainage systems; and in preparation of plans and specifications for the construction and repair of public and industrial buildings, residences, and other structures. Normal duties of resident and supervising engineers also include responsibility for advice on maintenance and on minor construction.

Canadian Wildlife Service³

The annual surveys of waterfowl populations and productivity were carried out throughout Canada in co-operation with the United States Fish and Wildlife Service, provincial game branches, and other agencies. In order to facilitate development of adequate aerial census methods, studies were made of daily movements and relative activity of ducks at various times of day. Factors affecting the survival of ducks were investigated.

Surveys of woodcock and spring counts of winnowing snipe were again carried out in the eastern provinces. In this case the co-operating agencies included the Wildlife Management Institute, provincial game departments, and the Royal Canadian Mounted Police; unofficial volunteers also participated in this work.

Crop depredation problems in the Prairie Provinces continued to receive attention. In connection with a projected development of the eider-down industry, detailed studies of the ecology of the eider duck were commenced near Cape Dorset on Baffin Island, N.W.T.

¹See Appendix B, Nos. 12, 13, and 14.

²See Appendix B, Nos. 2, 3, and 5 to 7.

³See Appendix B, Nos. 15 to 17; and Appendix F.

A quinquennial census of sea-birds inhabiting the bird sanctuaries along the north shore of the Gulf of St. Lawrence was taken during the summer of 1955. The status of murre colonies in Digges Sound, Quebec, was investigated, and 10,000 of the murres were banded. A co-operative investigation was carried out on the breeding grounds of the whooping crane in Wood Buffalo National Park.

Organization of banding records and participation in banding programs continued during the year. The technique of using retrievers to capture flightless ducks for banding was developed and tested on the prairie breeding grounds.

Two new sanctuaries were established under the Migratory Birds Convention Act. The total number of these sanctuaries is now 88.

Scientific research on mammals was devoted to problems in the North-west Territories, Yukon Territory, northern Quebec, and the National Parks. A re-survey of the continental range of the barren-ground caribou was conducted in co-operation with provincial game departments. Long-term investigations of fur-bearers, bison, moose, musk-ox, and wolves in the Territories were continued. Big game populations and their forage conditions were studied in the National Parks.

Three limnologists and a summer assistant carried out limnological surveys on lakes and streams in the National Parks and studied fish populations in those waters. Special studies were made of cutthroat and lake trout in the mountain parks. Coarse fish were eradicated with rotenone powder from lakes in Banff and Riding Mountain National Parks. Advice was given on the operation of fish hatcheries and on various aquatic matters, such as the control of swimmers' itch, mosquitoes, leeches, algae, and aquatic vegetation. The collection of creel census data was continued, but on a limited scale. Assistance was given in revising fishing regulations in the National Parks.

National Museum of Canada¹

The National Museum of Canada is a natural history museum devoted to illustrating the natural history and the natural resources of Canada. It carries out research in biology, vertebrate palæontology, and anthropology in various parts of Canada by field parties led by and chiefly composed of members of its technical staff. During the past year, seventeen such parties carried out investigations right across Canada from coast to coast and north to the Arctic. These brought in a large amount of valuable material for study and exhibit. In addition, other material was secured by purchase; for example, the large West Coast Indian collection belonging to Sir Alfred Bossom of London, consisting of over 1,600 items, was bought and is now available for display.

Archæology

The important site of Early Man in America discovered in 1954 on the east bank of the Firth River in the Yukon, about 20 miles from the Arctic Ocean, was excavated. Nine successive cultures were unearthed, and a vast amount of material was secured. A further season's work is necessary.

¹The National Museum issues a separate Annual Report which describes its work in greater detail. See Appendix F.

Excavations were continued on the important site of primitive man at Sheguiandah on Manitoulin Island with a crew of fifteen for two months. Survey operations were also carried out in the Parry Sound and Muskoka districts. In the Aylmer-London-Mt. Bridges region previously discovered sites were checked.

A survey of Indian sites was also made in New Brunswick.

A joint expedition of the Smithsonian Institution of Washington and the National Museum of Canada carried out further investigations on Southampton Island in connection with early Eskimo sites.

Ethnology

A beginning was made on the anthropological study of the Acadian French-speaking people of New Brunswick. The historical records were examined to find out how their ideology was built; this was followed by the study of a typical village. A survey was also made of the most characteristic features of the language spoken in that area.

Linguistic and folklore materials were collected among the Slavey Indians of Fort Simpson.

Assistance was given to a linguistic and ethnographic survey made of the Eskimos of the Belcher Islands of Hudson Bay. Folklore research was continued in Nova Scotia, New Brunswick, and Quebec.

A new system of classification and cataloguing was applied to folklore materials collected by the Museum staff over the years.

The section also assisted the Research Centre for Amerindian Anthropology in launching the publication of an anthropological periodical.

***Zoology*¹**

Field investigations and collections were made in many parts of Canada. Mammals, birds, reptiles, amphibians, marine invertebrates, and fossil crocodiles, dinosaurs, and Tertiary mammals were studied and collected by Museum scientists.

***National Herbarium*²**

Botanical investigations were conducted in Alberta, Quebec, and New Brunswick. Large collections of plant specimens were made, including material for exchange with other botanical institutions. Photographs and recorded notes supplied much valuable information concerning the mosses, ferns, and flowering plants of the areas visited. The specimens resulting from field work were studied and classified in the herbarium, together with collections submitted for determination and report by various government departments, by other herbaria, by the botanical departments of Canadian or foreign universities, or by individuals.

***Educational Services*³**

The National Museum, by means of publications, lectures, photographs, and other visual aids, and correspondence, assisted the public to become acquainted with the wealth of information gathered throughout the years. Services to other institutions included the loan of specimens and the

¹See Appendix B, Nos. 18 and 19.

²See Appendix B, 20(d).

³See Appendix B, Nos. 20 and 21.

identification of material. Exhibits were improved and extended. Guided tours for over four thousand students and other groups were given. Wednesday evening lectures for adults and Saturday morning lectures and film programs for children again proved very popular. During July and August a motion picture program "Canada in Colour" was shown every afternoon from Monday to Friday. The Macoun Field Club, consisting of three age-groups of boys and girls interested in natural history, had another successful year.

Water Resources Branch

The Water Resources Branch succeeded the former Engineering and Water Resources Branch in September 1955. It is composed of the Hydraulics Division and the Administration Division, with the duties of the latter including certain services to the Northwest Territories Power Commission. The Director of the Branch is a Member of the Northwest Territories Power Commission, of the Fraser River Board, and of a number of International Engineering Boards and Boards of Control set up by the International Joint Commission.

The water and power resources of Canada are the concern of this Branch, as are also international and federal-provincial water problems. The Branch also undertakes hydrometric investigations in the Yukon and Northwest Territories and in all provinces except Prince Edward Island.

The main function of the Branch is to acquire, analyse, and publish stream-flow and run-off data for all Canada. This information is used in power development, storage, irrigation, drainage, flood warnings and flood control, fisheries research, navigation, domestic water supply, and international waterway problems. Studies are made on international waterway problems, and engineers of the Branch serve on boards and committees, and act as technical advisers to the Department of External Affairs and the International Joint Commission. The Branch is directly responsible for the administration of the International River Improvements Act; also for the administration of the Dominion Water Power Act and Regulations in the Yukon and Northwest Territories and on public lands. It reviews applications for assistance under the Canada Water Conservation Assistance Act and submits pertinent recommendations.

The Branch co-operates with public and private agencies in water-power and water-supply problems, and serves as a central repository for hydrometric and water-power information. It co-operates with the provinces in maintaining gauging stations and in carrying out hydrometric investigations of mutual concern, and with the United States Geological Survey and the United States Lake Survey in the operation of international gauging stations. During the year, the staff carried out a number of special investigations, particularly in connection with Lake Ontario and with the Columbia, Niagara, St. Lawrence, and international prairie rivers.

Hydrometric Services¹

Stream gauging is an important part of the Branch's work. During the year 1,135 gauging stations were maintained, and 5,089 stream discharge measurements and 2,491 inspections of gauging stations were made by the technical field staff.

At Calgary there is a fully equipped station for the repair and calibration of the stream-gauging apparatus and for experimental work on new instruments. Meter ratings totalling 234 were carried out during the year. These services are available to other organizations as well as to the Branch.

¹See Appendix C, Nos. 1 to 3.

The monthly flow records of 22 typical rivers, well-distributed across Canada, are computed promptly and issued to the public. They are also provided by airmail to Washington, where by joint arrangement a monthly summary of stream-flow throughout North America is published early in each month by the United States Geological Survey.

For Canada as a whole, total run-off for the year was slightly above normal, the average for the 22 typical rivers being 108 per cent of median flow. Although excessive monthly discharges were recorded in occasional instances on some of the rivers, well-below normal run-off predominated for the greater part of the year in Ontario, Quebec, and the Maritime Provinces. Prairie run-off was consistently high throughout the year, and flood damages were suffered along the Qu'Appelle and Assiniboine rivers as a result of a high spring run-off. Flooding in the mid-southern section of British Columbia was caused by heavy rainfall in June. In Nova Scotia, extensive flooding occurred in January as a result of severe storms.

On rivers subject to dangerous floods, continuous records of river stage are obtained, and a flood warning service is provided. On the Columbia and Fraser Rivers, river-stage forecasting is valuable during the annual snow melting period. Commencing the first of May each year, daily observations from 21 key points are telegraphed to the Vancouver office. From these reports and from current meteorological data, a daily computation of probable stages in the lower river reaches is made available to any interested parties making inquiries. The Vancouver office co-operates with United States authorities in forecasting stages on the lower Columbia River. The Calgary office forecasts stages on the North and South Saskatchewan Rivers and sends the information to Edmonton, Medicine Hat, Saskatoon, and Prince Albert, and to provincial authorities in Saskatchewan and Manitoba; it also participates in the work of the Bow River Ice Committee in the alleviation of flood hazard on the Bow River. The Winnipeg office forecasts stages on the Winnipeg River and co-operates with the local authorities in the Red and Assiniboine river flood forecasts.

Annual surveys of the water content of the snow-cover are made on typical courses in important drainage basins for the purpose of estimating the amount of spring run-off. From a more long-term viewpoint, glacier surveys are made at two-year intervals covering five glaciers in British Columbia and six in Alberta.

On the basis of the Branch's hydrometric investigations and other data, revisions are made from time to time in the estimates of the water resources of Canada. The current estimate shows resources of 50,705,000 h.p. at ordinary six months flow, which will permit an economic installation of about 66,000,000 h.p. During 1955 new hydraulic installations totalled 839,630 h.p. bringing the installed capacity of all water-power plants in Canada to 17,531,536 h.p. Central electric stations make up 88 per cent of this amount. New plants and extensions under active construction for operation in 1956 are tentatively rated at about 1,000,000 h.p.; others with a total capacity of approximately 4,000,000 h.p. are under preliminary construction or definitely planned. The Branch's annual bulletin, *Water Power Resources of Canada* (March 15, 1956), reviews the current water power situation.

Waterway Problems and Water Power Administration¹

Members of the Branch serve on many international and federal-provincial boards whose purpose is to study problems relating to the control of boundary waters. The district offices help other federal agencies in engineering and administrative activities.

The Branch administers the Dominion Water Power Regulations, which were extensively revised in 1954; developments made under their authority are inspected, and rentals are collected. A priority permit, covering the development of power from waters of the southern part of the Yukon River drainage basin and of the Alsek River basin, Yukon Territory, which was issued to the Northwest Power Industries Limited on August 18, 1954, was renewed on August 16, 1955, for a period of one year. The company's scheme envisages the ultimate development of approximately 5,000,000 h.p. by storage in the upper Yukon River basin and its diversion through northern British Columbia.

Water Resources Papers are published at irregular intervals, each volume giving hydrometric and run-off data covering one of the four drainage divisions of Canada for two climatic years. Paper 'No. 114, which covers the Pacific Drainage, was issued in April. The two regular annual water-power bulletins were issued, one in January and one in March. Water power articles were revised for the 1956 *Canada Year Book* and for the Handbook "Canada 1956".

¹See Appendix C, Nos. 4 to 6.

Forestry Branch

The Forestry Branch provides guidance through research and demonstration in the adoption of scientific principles for handling Canada's forest resources. Use by industry, and wastage through fire, insects, and disease are combining to reduce the value of Canada's forest estate. Supplies of merchantable timber are becoming increasingly remote, and logging costs are rising. Composition of the forest is changing. Valuable species are yielding place to inferior varieties. These conditions give rise to many problems of national importance relating to the development, protection, and utilization of Canada's forests—problems which are studied by the Forestry Branch.

The Branch engages in three main fields of research: forestry, forest products, and forest economics. In addition to this, it administers federal-provincial agreements under the Canada Forestry Act, including forest inventory and reforestation. It also co-operates in the financing of the budworm-spraying operation in the Province of New Brunswick, and assists and advises the Department of National Defence in protection and timber disposal on National Defence lands.

To carry out this work, the Forestry Branch, apart from the Administration Section which includes Forest Economics, is organized under three separate divisions, namely, Forest Research Division, Forest Products Laboratories Division, and the Operations Division.

The year under review saw the commencement of a building program which will provide up-to-date accommodation and facilities for the forest and forest products research conducted by the Branch. Construction was commenced on a new forest research laboratory at the Petawawa Forest Experiment Station, and it is expected that this building will be equipped and ready for operation by the end of November, 1956. Plans were prepared for new forest products laboratories in Ottawa and Vancouver, and for a new laboratory to be operated by the Pulp and Paper Research Institute of Canada at Pointe Claire, Que. Construction of all three buildings is expected to commence in 1956. Provision of these long overdue and badly needed new laboratories will permit accelerated progress in the programs of forest and forest products research conducted by the Branch and by the Pulp and Paper Research Institute of Canada. They will give concrete recognition to the importance of the forests and forest industries in the Canadian economy and the significant part which research must play in their future development.

*Forest Economics*¹

The Forest Economics Section provides economic and statistical services, its statistical unit maintaining basic data on forest resources, and production and trade in forest products. The economic activities include the analysis of these statistics and the rôle of the forest industries in the national economy; studies of forest legislation at all government levels; analysis of provincial forest resource information on which to base the

¹See Appendix D, Nos. 1 to 3.

national forest inventory; preparation of economic and statistical reports to international organizations, such as the Food and Agriculture Organization (F.A.O.) and the British Commonwealth Forestry Conference; and research projects in the economics of forestry.

The Chief of the Section was seconded during the year to the Royal Commission on Canada's Economic Prospects as Co-Ordinator of the Commission's forestry study group, and the Section offices were made the headquarters for the statistical work of the group. The Section continued to be represented on the Interdepartmental Food and Agriculture Organization Committee.

Forest Industries

The Canadian forest industries maintained the high level of production of the previous year, partly because of the steadily increasing world demand and partly because of the accelerated consumption of forest products in Canada. The value of exports of forest products has risen by 10 per cent over 1954, and represents 35.5 per cent of the total value of Canada's export trade.

The pulp and paper industry in 1955 produced a record 10.1 million tons of wood pulp, from which nearly 6.2 million tons of newsprint were produced, representing a 3.2 per cent increase over the previous year. Overseas demand continued to remain strong for both wood pulp and newsprint, and the value of exports of both commodities increased substantially over 1954. An estimated 7,800 million board feet of lumber was produced in 1955 representing an increase of 8 per cent over last year, and exports of lumber increased by 14 per cent.

During 1954 the utilization of forest products amounted to 3,661 million cubic feet, almost 17 per cent more than the average utilization for the ten-year period 1944-53, reflecting the healthy state of the forest industries.

The accessible productive forests of Canada cover an area of 373 million acres and constitute the source of supply of forest production for many years to come. This area supports stands of timber having a volume estimated to be 312,800 million cubic feet, of which about 150,000 million cubic feet are presently under lease or private ownership. The timber utilized in 1954 represents about 1.2 per cent of the accessible productive volume and 2.4 per cent of the merchantable volume on the occupied forest area. It is apparent from a comparison of these percentages that a higher rate of cutting occurs on the occupied forest lands, and that the annual growth on the remainder of the accessible productive forests is not being utilized. Thus, if the forest industries are to maintain their dominant position in the development of Canada, it is necessary that all the accessible forests be managed in an orderly manner.

The net value of production of the forest industries in 1953 was \$1,988 million or 14 per cent of the total net value of production of all Canadian industries. In 1938, this relationship was only 11 per cent, an indication of the relative increase in development of the forest industries in the economy of the country.

Forest Research Division¹

Forest research necessary to the improvement of forest management practices in Canada is conducted independently or in co-operation with other federal departments, provincial forest authorities, other research agencies, universities, or industrial companies. Research activities include fact-finding surveys to evaluate existing conditions, fundamental studies concerning the characteristics and behaviour of forest species and the influence of different factors of their environment, and applied research to develop practical methods for influencing forest development and improving operating and research techniques.

Within the Forest Research Division there are three Sections concerned respectively with silviculture and management, forest inventories, and forest fire protection, and five district offices located at Calgary, Alta.; Winnipeg, Man.; Valcartier, Que.; Fredericton, N.B., and St. John's, Nfld.; and the Ontario Research Unit at Ottawa.

Silviculture and Management Research

Silviculture deals with the theory and practice of controlling forest establishment, composition, and growth, while forest management is concerned with the application of business and technical principles to the operation of forest properties so as to achieve continuous production, with the net growth and harvest in approximate balance.

The principal tasks within this field of forest research are as follows:

1. Development of a satisfactory system for classifying forests and forest sites.
2. Determination of the silvical characteristics of Canadian tree species, and the ecological relationships of the associations in which they occur.
3. Development of methods of silviculture which are applicable to the more important forest types and to Canadian economic conditions.
4. Development and testing of practical methods for determining the actual and potential growth and yield of forests.
5. Development of improved techniques of reforestation, and of improved strains of tree species suitable to Canadian conditions.
6. Improvement of methods of organizing forest data into plans of regulation and silviculture for forest areas, which will be suitable to different intensities of management.
7. Improvement of research methods, mensuration, techniques, and the design of experiments.

In all districts, studies of forest and forest site classification were in progress to provide the basic framework within which both research and forest management must be conducted. Fundamental ecological studies, tree breeding, and research in tree physiology continued, with the major part of this work being done at the Petawawa Forest Experiment Station, Chalk River, Ontario.

Tests of silvicultural techniques, with emphasis on regeneration following cutting and fire, were continued in all districts. The increasing interest shown by forest industries and provincial agencies in this type of work is apparent from the many requests received by the Forest Research Division for technical assistance in planning such applied experimentation.

¹See Appendix D, Nos. 4 and 5.

Forest Inventories Research

Forest inventory techniques are being developed to keep pace with advances in air photography. Tables are being compiled to help the air photograph interpreter prepare preliminary estimates of timber volumes. When detailed information is required, ground sampling is then necessary. A comparison of various inventory sampling methods was made in a company's timber limits, and valuable information was made available by the aid of statistical analysis.

Provisional forest maps covering 4,640 square miles in the northern territories and in Wood Buffalo National Park were prepared from air photographs, largely for use by the 1955 and 1956 field parties. Work was continued on the revision of provisional maps and the preparation of timber estimates by the aid of field data, including those of 641 sample plots measured in 1955. The Dominion Bureau of Statistics computed and tabulated the sample plot data. The Northern Administration and Lands Branch supplied assistants and equipment for field work.

Provisional forest maps covering 2,050 square miles of Banff National Park were prepared. Forest maps of the Acadia Forest Experiment Station, the Utopia Military Training Ground, New Brunswick, and the St. Joseph's Island Ordnance and Naval Reserves, Lake Huron, comprising 35, 16, and 4 square miles, respectively, were prepared.

Fire Protection Research

Many of the major problems in forest fire research are related to the measurement of fire danger and fire control planning. Most investigations are made at the request of provincial and other forest protection agencies, which often co-operate in the undertakings. All members of the staff of the Section are in Ottawa, though most of the technical officers spend about half of each year, the fire season, in the field at forest experiment stations or at temporary fire research stations.

Simplified forest fire danger tables for Newfoundland, New Brunswick, Quebec, Ontario, and Manitoba were prepared for publication. Basic field studies are being continued in Saskatchewan and Alberta. Other investigations include experiments with forestry hose, soil sterilizers, maintenance of fire guards, back-pack pumps, and logging slash disposal.

Forestry Operations Division

The main function of this division is the administration of federal-provincial agreements made under the Canada Forestry Act. The division also administers an agreement with the Province of New Brunswick to assist in an aerial spraying operation against the spruce budworm. It maintains an Education Section and a Parks Section and, under an arrangement with the Department of National Defence, provides for forest fire protection and other forestry operations at Camp Gagetown, N.B.

Provincial Agreements¹

Forest Inventories²

The Minister of Northern Affairs and National Resources announced on March 12, 1956, that the Federal Government had decided to allow two more years for completion of the initial forest inventory agreements,

¹See Appendix D, No. 8.

²See Appendix D, No. 6.

and to assist the provinces for five years in keeping their inventories up to date. These additional years will allow provinces which have not yet entered the program to do so for this period. The Federal Government will pay half the cost of these programs and will also continue to assist the provinces with reforestation.

The Province of Alberta completed its initial inventory on March 31, 1956. Other inventories in Saskatchewan and Manitoba are practically finished. Additional work was done on the revision of earlier data where changes have occurred owing to growth and depletion.

Further progress was made on inventory surveys in British Columbia, Ontario, New Brunswick, and Nova Scotia, but one or two more years will be required to complete them. On the average, inventory work under the agreements is now about 82 per cent finished.

The maintenance of these inventories is an important phase of the work envisaged under the agreements, since they not only will provide a basis for the administration and management of the forests by the provinces, but also will supply data for an annual statement of the forest resources of Canada on a reliable basis.

Reforestation¹

Provinces that have maintained their reforestation programs on unoccupied Crown lands in any year at or above the average level of the last three years have received from the Federal Government under the agreements a payment of \$10 per thousand trees planted, for the 59,383,000 trees planted to date. In addition, the Federal Government is sharing the cost of seeding forest land by the payment of \$1 per acre seeded and is paying one-fifth the cost of establishing and operating new forest nurseries.

Prince Edward Island, under a special agreement, is receiving 50 per cent of the cost of the reforestation of waste lands unsuited to agriculture.

During 1955-56, work on new nurseries was continued in Prince Edward Island and Manitoba. Saskatchewan, Ontario, Nova Scotia, and Prince Edward Island planted 11,386,000 trees. The Province of Saskatchewan seeded an additional area of 230 acres.

Liaison officers at Calgary, Winnipeg, Ottawa, and Fredericton assist the District Forest Officers of the Forestry Branch in administering the federal-provincial agreements in the field.

Aerial Spraying Operation—New Brunswick²

The agreement with the Province of New Brunswick for anti-budworm aerial spraying has been extended for a further period of three years until March 31, 1959. Under this agreement, the Federal Government pays one-third of the cost up to a maximum of \$3,000,000 between September 13, 1952, and March 31, 1959. The Government of New Brunswick and the forest industries in the area affected are each contributing one-third of the cost.

Spraying operations in 1955 were again conducted by a Crown corporation, Forest Protection Limited, organized for that purpose. Using the six airfields previously constructed, about 545,000 gallons of D.D.T.

¹See Appendix D, No. 7.

²See Appendix D, No. 9.

insecticide were sprayed from 80 aircraft over approximately 1,100,000 acres of pulpwood forests. The net area now sprayed under the Agreement is approximately 3,400,000 acres, of which 600,000 acres have received more than one application of insecticide.

Studies by forest entomologists of the federal Department of Agriculture have indicated that the results of the 1955 spraying, in terms of foliage protection, compare favourably with previous years, with generally good recovery evident. However, no sign of a decline of the outbreak on unsprayed areas is evident, and plans have been made for spraying an area of about 2,000,000 acres in 1956. Four new airfields have been built for this purpose.

National Parks

This Section provides advice and assistance in management of forests in the National Parks, and furnishes liaison between branches of the department on forestry problems.

Forest type maps are being prepared for a three-to-five-mile extension outside the eastern boundaries of Banff and Jasper National Parks to aid fire protection planning. At Jasper, work was continued in forest surveys, laying out cutting operations and establishing a small tree nursery. Co-operation was maintained with the Division of Forest Biology, Department of Agriculture, in the study of forest insects and tree diseases.

Education¹

More than 67,000 pieces of literature were distributed to organizations and individuals interested in forestry educational topics and forest research in the fields of silviculture, management, fire protection, inventory, and economics. For the third successive year, posters bearing the Canada Jay as a symbol of forest protection were displayed in post offices across Canada. During the early part of the forest fire danger season, the Post Office Department cancelled mail from several key cities with special dies bearing forest fire prevention slogans. The Canada Jay symbol was used on metal-reflecting signs erected along roads in federal forest experiment stations and at Camp Gagetown.

Window displays, maintained at the Forestry Branch Head Office, Ottawa, brought a number of requests for forestry literature and for similar displays at various functions. There were 392 black-and-white prints and 310 colour slides added to the photographic library; a number of photographs were supplied for use in publications. Prints of the training films "Fighting Forest Fires with Hand Tools" and "Fighting Forest Fires with Power Pumps" are in constant demand for use by groups interested in forest protection. A third film in this series, "Forest Fire Suppression", dealing largely with the tactics and strategy of forest fire control, was completed this year.

Camp Gagetown, N.B.²

The Branch, under an arrangement with the Department of National Defence, carried out forest fire protection and forest management on the 430-square-mile military area in New Brunswick again this year.

¹See Appendix F.

²See Appendix D, No. 10.

Construction began on headquarters, consisting of an office and store-house, dormitory and dining hall, garage, workshop, and ranger's residence. Plans for ranger headquarters for the three other ranger districts were prepared. Locations for these have been obtained, and their construction will begin in 1956.

During the year, extensive forest areas were cleared for military purposes, and the resulting slash burning operations by contractors caused 48 of the 64 fires on the camp. However, the burned area was confined to 162 areas of forest land and 13 acres of non-forested land, apart from slash areas intended for burning. Timber valued at \$4,945 was destroyed, and the cost of Forestry Branch services and actual fire suppression was \$12,004.

Dues received from the sale of forest products, such as Christmas trees, sawlogs, poles, and fuelwood, together with hay and grazing dues, showed a marked increase during the year.

Other Military Areas

The Forestry Branch inspected forests on National Defence properties at Camp Sussex and Camp Utopia, N.B.; Chilcotin Training Area, B.C.; and Camp Borden, Ont. A timber estimate was provided for a small wooded area at Camp Sussex, a forest type map compiled of the forest land at Camp Utopia, and a report on forest conditions was made for the Chilcotin Training Area. At Camp Borden, a timber sale contract was arranged for the disposal of pulpwood from thinnings of pine plantations.

Forest Products Laboratories Division¹

The research work at both the Ottawa and Vancouver Laboratories followed the long-time plan for the determination of the various properties and physical characteristics of Canadian woods, with special emphasis on studies of particular interest to present industrial and economic development.

A growing demand for strength and related data of various species has increased activity in laboratory experimentation to expand information already on record. In the field of laminating, special emphasis has been on the suitability of various adhesives and gluing techniques, and on the strength of various types of joints. Yellow birch, elm, and spruce were rotary-cut and assembled to form plywood. Cutting techniques and lathe settings, as well as the pre-treatment of the bolts, were investigated, and results were made available to industry.

Studies were carried out to determine the occurrence of waste in conversion processes in order to devise methods and practices which would keep waste to a minimum.

Research has shown that low-grade waste, such as bark and sawdust, can be satisfactorily converted to commercial-grade fibreboards, and considerable work has been done to increase the quantities of sawmill waste being converted to pulp chips. Much of the findings of research has been disseminated by publications and articles in Trade Journals, and by conferences, papers, and discussions before trade and technical associations. More specific data have been supplied on request.

¹See Appendix D, No. 11; and Appendix F.

Members of the Laboratories participated in panel discussions at the following meetings: "Developments in Wood Utilization," Annual Meeting, Eastern Canadian Section, Forest Products Research Society; "Developments in Woods Equipment," Annual Meeting, Technical Section, Canadian Pulp and Paper Association; Technical Panels of the Packaging Association of Canada, on "Wooden Containers," and on "Corrugated Fibreboard Containers"; and "Durability and Chemistry of Western Red Cedar," at a meeting of the Consolidated Red Cedar Shingle Bureau.

Co-operation with government departments and agencies on a number of short-term research projects and investigations has proved particularly beneficial in determining adequate building standards and practices.

There has been continued activity in committee work and general participation in the research side of the Canadian Standards Association, the American Society for Testing Materials, the American Wood Preservers' Association, and the Food and Agricultural Organization of the United Nations.

The Chief of the Division was the forestry representative on the Canadian delegation to the FAO Conference held in Rome, November 4 to 25, 1955. A "Statement on the Research Activities of the Forest Products Laboratories of Canada" was presented by the Superintendent of the Vancouver Laboratory to the Royal Commission on Forestry in British Columbia.

The exchange of information and the maintenance of close liaison with Forest Products Research institutions throughout the world is of particular importance to avoid unnecessary duplication of research effort, and to enable a realistic comparison of the properties, qualities, and suitability of Canadian timbers intended for foreign markets.

Considerable progress has been made in the planning of new laboratory buildings for Ottawa and Vancouver. Detailed plans and specifications have been completed, and it is anticipated that construction at both locations will begin during 1956.

New F.P.L. publications that became available during the year are listed in Appendix F.

Some of the more important work carried out at the Ottawa and Vancouver Laboratories is briefly reviewed below. A more complete listing of project and research work will be found in Appendix D.

Vancouver Laboratory

Considerable progress has been made in studies to determine the effect of variables on sawmill production, and in investigations aimed at providing data for use in developing sawing techniques which would minimize waste.

Industrial trend in the preparation of veneers for plywood manufacture has been toward the use of higher temperatures and more rapid drying schedules. Recent installations have favoured equipment of this type and has lent impetus to work initiated to study the effects of dryer temperatures upon the gluing properties of Douglas fir veneers. More rapid drying schedules are economically desirable, provided they do not degrade the veneers. Investigations so far concluded have shown that too severe temperatures cause a loss of strength and deterioration of the wood fibres. This loss of strength is largely responsible for the poor bonds previously attributed to glue failures.

A number of charges of western hemlock and Douglas fir were treated in a small experimental wood preservation retort. From data obtained, an empirical formula was developed indicative of the influence of temperature, dimensions of product, vacuum time, and initial moisture content on the amount of water boiled from western hemlock of pole sizes.

Causal fungi in lodgepole pine samples, obtained from central and northern British Columbia, were identified. Some 50 per cent of all infections studied were found to be caused by *Fomes pini*.

Chemicals obtained from western red cedar were sent to a university entomologist. MethyI thujate, one of these chemicals, was found to have some toxicity to larvae of the casemaking clothes moth.

It was of significant interest to the pulp and paper industry that the presence of a colour precursor, believed to be a leucoanthocyanin related to taxifolin, was detected in analytical chemical studies of Douglas fir wood.

Sawmill waste studies were conducted in the Nelson Forest District along with studies of grade recoveries from logs of various species and diameters. The effect of planing and seasoning—kiln-drying and air-drying—on lumber recovery was investigated at plants in the Fort George District.

Investigations were carried out on the occurrence and nature of spiral grain in various western Canadian woods, as well as the effect of such grain on various uses and applications.

Further research was carried out on extractives of western red cedar, and studies were made to determine the percentage content of such extractives, at various points, of trees of different age groups. It was found that the durability of western red cedar was attributable to the presence of these extractives and that even in those sections of the tree where percentages were low, the content was yet sufficient to ensure long durability.

Identification of isolates from red-hearted lodgepole pine has been completed. It was shown that three fungi, *Fomes pini*, *Stereum pini*, and *Stereum sanguinolentum*, were almost entirely responsible. Inoculation of lodgepole pine specimens and re-isolation from the infected wood to prove causation by these organisms are now in progress.

Studies of the behaviour of mountain type Douglas fir telephone poles under load were completed. Both treated and untreated poles were included in the investigation. A report is being prepared and includes discussion of the effects on strength of knots, checks, splits, and other defects. These data will be of particular value to engineers engaged in pole line design.

A study was conducted to determine the effect of mechanical debarking on lumber grade recovery, overrun, and sawing time. Comparative groups of barked and unbarked logs were included. Although all sampling was on a limited basis, it did appear, however, that for debarked logs there was a slight improvement in the quality of sawing.

Ottawa Laboratory

Studies have shown that the short-log bolter can be used advantageously for the economic production of furniture and hardwood dimension stock from low-grade and defective material, unsuited for normal sawmill

conversion, as well as from trees of commercial size and quality. These studies are of particular importance because of the availability of much hardwood material of many species, which for economic reasons are at present unharvested.

Progress has been made in studies to determine the causes of blistering of paint coatings on wood, and on the resistance to darkening of clear finishes over white pine and western red cedar. Investigations continued on various phases of the paintability of wood and the determination of the resistance of coatings to climate conditions in various parts of Canada.

It has been demonstrated that veneers of acceptable quality can be produced by rotary-cutting elm and white spruce. Optimum lathe settings and cutting techniques were determined for these species. Plywood of elm and white spruce have been produced, and tests have shown them to possess adequate commercial qualities.

There has been continued development of basic data pertaining to the mechanical and physical properties of eastern Canadian timbers, with a view to publication, at a later date, of revised strength data for the various species. Another study was concerned with the determination of the bonding strength of machine-shaved red pine telephone- and power-line poles. A testing procedure was developed upon which a new performance specification for fibreboard containers has been based.

A comprehensive investigation was carried out on the various factors influencing the strength of glued scarfed end joints, which are so important in glued laminated construction. Scarfed joints of various types were shown to have widely different efficiencies, and information was made available to industry on several fabrication details related to greater safety in timber constructions.

Synthetic resin adhesives, in the uncured state, were studied to determine their dielectric properties. The dielectric constant and conductivity of 19 commercially available adhesives were evaluated at normal radio frequencies. Great differences between the adhesives were found to exist.

Chemical modification (esterification) for improving the dimensional stability of wood has been studied. The technique used is applicable to the stabilization of veneers and may prove of practical industrial value.

New techniques in the field of utilization of wood waste by fermentation with rumen bacteria were developed. Pure cultures were successfully isolated, and fermentations were carried out with these.

The fungus *Poria cocos*, which may be of importance in reducing the service life of both hardwood and softwood timbers in contact with the ground, has been isolated for the first time in Canada from timber in service. This fungus has been proved to be the cause of butt-rot in living birch and poplar in Eastern Canada and could be particularly dangerous in poplar pulpwood because of its ability to continue to grow in stored logs and to spread from infected to sound logs.

Investigations have established the practicability of high-temperature kiln-drying of Canadian softwoods. The most recent work in the drying of lumber at temperatures above 212°F. has been concentrated on yellow birch. Good progress has been made on establishing a satisfactory high-temperature schedule for this species.

Encouraging progress has been made on the establishment of a Canadian Standard for softwood yard lumber. This is an attempt to obtain standardization across the country of lumber sizes, nomenclature, etc., and of recommended grades by the various lumbermen's associations for certain uses.

Anatomical studies of the mechanism of wood shrinkage during drying have indicated that the shrinkage reaction of individual wood cells is likely to induce small intercellular separations which contribute to the occurrence of fractures in wood under stress. Research has continued on the anatomical features of compression and tension wood and the effect of these abnormalities on strength.

1955 Annual Report

Canadian Government Travel Bureau¹

The Canadian Government Travel Bureau is the federal agency established since 1934 to promote travel to and within Canada and to further the general interests of the Canadian tourist industry. Most of its staff of approximately 85 persons are in Ottawa, but branch information offices are operated at ground-floor locations in New York City and Chicago. The Bureau has a travel representative at the Canadian Consulate-General in Los Angeles, and special assistance on travel information is given by the Consulate-General at San Francisco.

Plans were made in 1955 to integrate all the Ottawa operations of the Canadian Government Travel Bureau under one roof, and the move to more modern premises in a newly constructed office building at Kent and Albert streets will be made in 1956.

The Tenth Federal-Provincial Tourist Conference was held at Ottawa on November 28 and 29, with delegates from federal departments, provincial tourist organizations, and the leading transportation companies. The conference supported the idea of a "Know Canada Better" program intended to encourage Canadians to see more of their own country through recreational travel.

The tourist industry set new records in 1955, with revenues amounting to \$329 million, of which \$304 million came from United States visitors. Canadians spent \$441 million on travel in other countries, of which \$361 million was expended in the United States. There were 28,300,000 border crossings into Canada in 1955, and an estimated 7,000,000 United States residents spent all or part of their vacations in this country. The National Parks of Canada established a new attendance record, 2,825,632 persons, for the April-August period.

The Canadian Government Travel Bureau serviced 406,303 individual inquiries in 1955, of which 369,607 came from the United States. An advertising program costing \$949,418 was conducted in 61 newspapers and 51 magazines, all of them in the United States.

The Bureau's principal publication, "Canada—Vacations Unlimited", was completely redesigned, and half a million copies were printed in 1955. The Bureau now produces 75 different publications, including those for the National Parks of Canada. New publications produced during the year included separate ones for Riding Mountain and Prince Albert National Parks. Eight new travel posters were added to the current series, making 20 different poster subjects available for distribution, nearly half of them in four colours. There was a substantial gain in the number and scope of promotional projects involving quantity mailings of travel literature. The year's distribution of publications prepared by the Bureau numbered 3,039,000 pieces of literature, largely to the United States.

¹See Appendix E, No. 1.

Publicity mailings of black-and-white photographs, mostly on request, amounted to 8,766 glossy prints, and 861 colour transparencies and 543 (35 mm.) colour slides went on loan to editors. The 1955 summer schedule of photography added 182 new black-and-white subjects to the photo library and an approximately equal number of colour subjects. There were 15 black-and-white negatives and 87 colour transparencies purchased from private photographers. Four-colour engravings were again loaned to magazine editors and provincial tourist bodies. A mat service for Canadian weekly newspapers, launched on behalf of the National Parks of Canada, met with considerable success and will be continued in 1956. Editorial publicity was continued on an expanded scale in United States magazines and newspapers.

During the summer of 1955 major photographic schedules were undertaken in Canada, from coast to coast, by the National Film Board photographers on assignment from the Bureau, to secure travel subjects and National Parks still pictures.

In 1955 the 147 film libraries, maintained in the United States by the Bureau in co-operation with the National Film Board, recorded 76,797 screenings of 16 mm. Canadian travel films, to audiences totalling 4,564,365. Thirty-one of these subjects were seen by even larger audiences on 2,124 telecasts over stations throughout the United States, a marked expansion in the free television library's activities.

APPENDICES

APPENDIX A

1. Mineral Production

	1954		1955		Cumulative Total To Year Ended Dec. 31, 1955
	Quantity	Value	Quantity	Value	
Northwest Territories					
		\$		\$	\$
Gold.....	308,563 oz.	10,512,741	321,321 oz.	11,092,001	82,862,923
Silver.....	59,037 oz.	49,152	58,477 oz.	51,565	1,261,236
Lead.....	—	—	—	—	4,933
Copper.....	—	—	—	—	26,607
Pitchblende ²	(not given)	15,486,157	(not given)	13,248,198	34,539,778 ¹
Crude Petroleum...	369,887 bbl.	344,960	404,219 bbl.	1,185,780	6,268,110
Natural Gas.....	29,085 Mcu.ft.	9,700	18,670 Mcu.ft.	6,213	81,367
Tantalum (Ta ₂ O ₅)..	77 lb.	2,696	390 lb.	9,760	12,456
Tungsten.....	—	—	—	—	53,146
Columbium (Cb ₂ O ₅)	90 lb.	2,294	42 lb.	1,032	3,326
TOTAL.....	—	26,407,700	—	25,594,549	125,113,882
Yukon Territory					
		\$		\$	\$
Gold.....	82,208 oz.	2,800,826	72,201 oz.	2,492,379	240,222,685
Silver.....	6,992,279 oz.	5,821,562	5,712,219 oz.	5,037,035	49,382,641
Lead.....	33,765,290 lb.	4,500,913	26,248,786 lb.	3,774,775	25,723,778
Copper.....	—	—	—	—	2,711,695
Coal.....	14,113 tons	202,772	7,040 tons	81,806	1,553,647
Tungsten.....	—	—	—	—	25,888
Zinc.....	23,645,588 lb.	2,832,741	21,823,307 lb.	2,978,881	12,004,750
Antimony.....	—	—	—	—	173
Cadmium.....	252,853 lb.	429,850	211,808 lb.	360,074	1,915,206
TOTAL.....	—	16,588,664	—	14,724,950	333,540,463

Oil and Gas Permits, Leases, and Reservations
Yukon and Northwest Territories

	Number	Acreage
N.W.T.—		
Active Oil and Gas Permits.....	189	10,275,334
Oil and Gas Leases.....	6	3,278
Surface Leases.....	2	892.2
Yukon—		
Active Oil and Gas Permits.....	14	747,803
Oil and Gas Reservations (N.W.T. and Yukon).....	2	1,533,440

Provincial Oil and Gas Leases

Province	No. Leases	Acres
Manitoba.....	61	10,538.18
Saskatchewan.....	115	17,990.01
Alberta.....	125	19,414.72
TOTAL.....	301	47,942.91

¹ Figures for the years 1932, 1942 to 1953 inclusive not available.² Includes radium salts, uranium oxides and salts, silver and cobalt.

2. Land Sales and Privileges, Hay and Timber Permits

	Yukon	Northwest Territories
LANDS SALES—		
Completed.....	58	25
New agreements of sale.....	37(a)	11(b)
Agreements of sale in force.....	140(c)	55(d)
(a) Includes 12 agreements for veterans.		
(b) Includes 3 agreements for veterans.		
(c) Includes 108 agreements for veterans.		
(d) Includes 17 agreements for veterans.		
LAND PRIVILEGES—		
New leases.....	29	38
Cancellations.....	28	27
Agricultural leases.....	6	8
Fur farm leases.....	1	4
Grazing leases.....	7(a)	4(b)
Licences of occupation.....	3	6
Permissions to occupy.....	18	22
Surface leases.....	131(c)	124(d)
Waterfront leases.....	21	38
(a) 73 horses maintained.		
(b) 12 cattle and 8 horses maintained.		
(c) Includes 2 leases for veterans.		
(d) Includes 13 leases for veterans.		
HAY PERMITS—		
Number of permits issued.....	4(a)	—
(a) 20 tons cut.		
TIMBER PERMITS—		
Number of commercial permits issued.....	47	12
Other permits—		
Permits free of fees and dues.....	12	13
Permits free of dues.....	16	10
Permits dues paid.....	199	65
Total timber permits.....	274	100

3. Volume of Timber Cut

	Yukon Territory			Northwest Territories (including Wood Buffalo Park)		
	Lumber	Round Timber	Fuel-wood	Lumber	Round Timber	Fuel-wood
	ft. b.m.	lin. ft.	cords	ft. b.m.	lin. ft.	cords
Commercial permits.....	2,768,579	882,274	696	6,198,804	292,740	39
Other permits—						
Permits free of fees and dues..	—	3,850	685	—	3,965	225
Permits free of dues.....	—	360	825	—	—	925
Permits dues paid.....	35,000	62,104	3,965	17,800	8,780	2,438
Total cut.....	2,803,579	948,588	6,171	6,216,604	305,485	3,627

4. Revenue

	N.W.T.		Yukon		Provinces		Total	
	\$	cts.	\$	cts.	\$	cts.	\$	cts.
Mining.....	214,571	72	170,579	95	2,221	22	387,372	89
Oil and gas.....	568,802	15	875	00	408,848	60	978,525	75
Lands, timber and grazing.....	77,992	69	59,174	22	78,207	89	215,374	80
Total.....	861,366	56	230,629	17	489,277	71	1,581,273	44

5. Seed Grain, Fodder and Relief Indebtedness

SUMMARY¹

	Principal		Interest		Total	
	\$	cts.	\$	cts.	\$	cts.
<i>Debits—</i>						
Amount outstanding, March 31, 1955.	808,191	68	1,547,532	72	2,355,724	40
Accrued interest April 1, 1955 to March 31, 1956.....	—		41,483	65	41,483	65
Total debits.....	808,191	68	1,589,016	37	2,397,208	05
<i>Credits—</i>						
Net Revenue April 1, 1955, to March 31, 1956.....	47,921	40	5,474	00	53,395	40
Amount written off as loss by Orders-in-Council, April 1, 1955, to March 31, 1956.....	114,659	49	328,196	59	442,856	08
Total credits.....	162,580	89	333,670	59	496,251	48
Amount outstanding March 31, 1956..	645,610	79	1,255,345	78	1,900,956	57

Manitoba

	\$	cts.	\$	cts.	\$	cts.
<i>Debits—</i>						
Amount outstanding March 31, 1955..	967	07	1,640	51	2,607	58
Accrued interest April 1, 1955, to March 31, 1956.....	—		34	02	34	02
Total debits.....	967	07	1,674	53	2,641	60
<i>Credits—</i>						
Net revenue April 1, 1955, to March 31, 1956.....	146	65	47	55	194	20
Amounts written-off as loss by Orders-in-Council, April 1, 1955, to March 31, 1956.....	820	42	1,626	98	2,447	40
Total credits.....	967	07	1,674	53	2,641	60

¹ Shows financial operations for year ended March 31, 1956.

5. Seed Grain, Fodder and Relief Indebtedness—(Cont'd.)

Saskatchewan

	Principal	Interest	Total
	\$ cts.	\$ cts.	\$ cts.
<i>Debits—</i>			
Amount outstanding March 31, 1955..	637,784 30	1,239,743 90	1,877,528 20
Accrued interest April 1, 1955, to March 31, 1956.....	—	31,253 14	31,253 14
Total debits.....	637,784 30	1,270,997 04	1,908 781 34
<i>Credits—</i>			
Net revenue April 1, 1955, to March 31, 1956.....	41,141 91	2,843 45	43,985 36
Amount written off as loss by Order-in-Council, April 1, 1955 to March 31, 1956.....	108,168 78	303,389 21	411,557 99
Total credits.....	149,310 69	306,232 66	455,543 35
Amount outstanding March 31, 1956....	488,473 61	964,764 38	1,453,237 99

Alberta

<i>Debits—</i>			
Amount outstanding March 31, 1955..	169,440 31	306,148 31	475,588 62
Accrued interest April 1, 1955, to March 31, 1956.....	—	10,196 49	10,196 49
Total debits.....	169,440 31	316,344 80	485,785 11
<i>Credits—</i>			
Net revenue April 1, 1955, to March 31, 1956.....	6,632 84	2,583 00	9,215 84
Amount written-off as loss by Orders-in-Council, April 1, 1955, to March 31, 1956.....	5,670 29	23,180 40	28,850 69
Total credits.....	12,303 13	25,763 40	38,066 53
Amount outstanding March 31, 1956....	157,137 18	290,581 40	447,718 58

APPENDIX B

1. Location, Area, and Comparative Statement of Visitors to the National Parks for the Period April 1 to March 31

	Province	Area	1955-56	1954-55	Increase or Decrease
National Parks					
Banff.....	Alta.	2,564 sq. mi.	701,199	648,952	+52,247
Cape Breton Highlands...	N.S.	390 "	75,310	123,731	-48,421
Elk Island.....	Alta.	75 "	170,692	152,550	+18,142
Fundy.....	N.B.	79.5 "	105,487	99,346	+ 6,141
Georgian Bay Islands.....	Ont.	5.4 "	23,440	14,705	+ 8,735
Glacier.....	B.C.	521 "	623	732	- 109
Jasper.....	Alta.	4,200 "	153,987	116,780	+37,207
Kootenay.....	B.C.	543 "	279,559	222,999	+56,560
Mount Revelstoke.....	B.C.	100 "	11,143	13,535	- 2,392
Point Pelee.....	Ont.	6 "	600,254	556,157	+44,097
Prince Albert.....	Sask.	1,496 "	117,621	112,659	+ 4,962
Prince Edward Island.....	P.E.I.	7 "	172,884	158,984	+13,900
Riding Mountain.....	Man.	1,148 "	566,793	523,027	+43,766
St. Lawrence Islands.....	Ont.	189 acres	74,907	45,213	+29,694
Waterton Lakes.....	Alta.	204 sq. mi.	227,291	219,621	+ 7,670
Yoho.....	B.C.	507 "	23,959	26,010	- 2,051
Sub-total.....		11,846.2 sq. mi.	3,305,149	3,035,001	+270,148
National Historic Parks and Sites					
Fort Anne.....	N.S.	31 acres	20,946	19,677	+ 1,269
Fort Battleford.....	Sask.	37 "	10,818	12,177	- 1,359
Fort Beauséjour.....	N.B.	81 "	23,572	23,245	+ 327
Fort Chambly.....	P.Q.	2.5 "	72,090	70,505	+ 1,585
Fort Lennox.....	P.Q.	210 "	14,610	11,899	+ 2,711
Fortress of Louisbourg....	N.S.	339.5 "	23,022	16,904	+ 6,118
Fort Malden.....	Ont.	5 "	16,356	17,252	- 896
Fort Wellington.....	Ont.	8.5 "	10,918	9,046	+ 1,872
Halifax Citadel.....	N.S.	37 "	121,213	102,689	+18,524
Port Royal Habitation....	N.S.	20.5 "	20,457	20,892	- 435
Sub-total.....		772.0 acres	334,002	304,286	+29,716
Grand total.....		11,847.4 sq. mi.	3,639,151	3,339,287	+299,864

N.B.—No attendance records available for Wood Buffalo Park, Alta.-N.W.T. (17,300 sq. mi.); Woodside Historic Park, Kitchener, Ont. (11 acres); Prince of Wales's Fort, Churchill, Man. (50 acres); Lower Fort Garry, Man. (13 acres).

2. Maintenance of Roads

National Park	Location	Work
BANFF.....	Trans-Canada Highway Mile 0 - Mile 10.8	Cascade River Bridge completed; multiplates for the Calgary Power Company installed at Anthracite; grading for realignment of Canadian Pacific Railway carried out.

2. Maintenance of Roads—(Cont'd.)

National Park	Location	Work
BANFF—Con.....	Mile 10.8 – Mile 14.3.....	Stripping and grading.
	Mile 14.3 – Mile 21.....	Stripping and rock work. Healy Creek diverted.
	Mile 21 – Mile 51.....	Pre-engineering, soil survey, and diamond drilling.
	Banff-Jasper Highway, Mile 0 – Mile 10.....	Graded; base gravels and $\frac{3}{4}$ -inch gravel placed; clearing work.
	Mile 0 – Mile 22.....	Grading 75 per cent complete; some culverts installed.
	Mile 22 – Mile 28.8.....	Clearing work.
	No. 1 Highway.....	Considerable amount of hauling of base course and asphalt priming carried out to repair frost damage.
	Upper Hot Springs Road.....	Clearing work; power lines re-located; reconstruction commenced and lower section received base course gravel.
	Mount Norquay Road.....	Work on widening road continued—blasting at Mile 3.
	Eastern approach road to Banff town-site from Trans-Canada Highway..	Road widened and grading work nearly completed; telephone lines re-located.
JASPER.....	Jasper-Banff Highway Mile 1.....	120-ft. flexbeam guard rail installed at southern approach to Miette River Bridge.
	Mile 15.....	Approaches to new Whirlpool River bridge completed.
	Mile 20.....	Asphalt surface on Athabasca River Bridge relaid.
	Jasper-Edmonton Highway Mile 1.5.	Concrete outlet wall on Cottonwood Creek culvert constructed; guard rail installed.
	Miette Hot Springs Road.....	500 bags calcium chloride laid; brush cut.
	Edith Cavell Road Mile 13 – Mile 18.	Road widened; 2 miles regravelled.
	Whistler Ski Hill Access Road.....	Right-of-way cleared.
KOOTENAY.....	Banff-Windermere Highway.....	13,000 cu. yd. gravel laid.
	Western Gateway – Red Rock Summit.....	1,800-ft. flexbeam guard rail installed.
YOHO.....	Trans-Canada Highway.....	Base course gravel completed.
	Mile 4 – Mile 7 – 10.....	Rockwork and earthwork practically completed.
	Mile 10 – Mile 16.....	Clearing, grubbing, and burning completed.
	Mile 16 – Mile 21.....	Clearing, burning, and construction completed.

2. Maintenance of Roads—(Cont'd.)

National Park	Location	Work
Yoho—Con.....	Mile 17·5 – Mile 18·7.....	Completed to sub-grade.
	Mile 19·5 – Mile 21.....	Completed to sub-grade.
	Mile 21 – Mile 28·5.....	Clearing, grubbing, and burning.
	Emerald Lake Road.....	Half a mile gravelled.
	Yoho Valley Road.....	One mile gravelled.
MOUNT REVELSTOKE.....	Main Road.....	13 culverts replaced.
FUNDY.....	Point Wolfe Road.....	Half-mile section completed by placing 10,546 cu. yd. gravel.
	Herring Cove Road.....	15,000 cu. yd. fill completed.
	Bennett Lake.....	Obsolete covered-bridge removed.
CAPE BRETON HIGHLANDS.	Cabot Trail – Ingonish Beach – Neil Harbour.....	10,000 ft. of guard rail installed.
	Neil Harbour – Effie's Brook.....	Widening and paving.
	Cabot Trail.....	12·9 mi. construction of base course and bituminous surfacing in Park and 6·6 mi. of provincial section was completed.

3. Improvements to Trails

National Park	Location	Works
BANFF.....	Alexandria River.....	6½ mi. new fire trail completed.
	Goat Creek.....	Fire road graded and improved.
	Upper Spray.....	8 mi. fire road graded and improved.
	Panther River.....	Bridge relocated.
	Alexandria River.....	One mile of horse trail revised.
JASPER.....	Geraldine Fire Trail.....	3 mi. brushed, widened, graded, gravelled, and culverts put in.
	Signal Mountain Fire Trail.....	6 mi. brushed and cleared.
	Medicine Lake – Maligne Lake.....	Widened, ditched, gravelled, and culverts installed.
	Jacques Lake – Medicine Lake.....	14 mi. trail widened.
	Seldom Inn – Willow Creek.....	5 mi. trail widened as a sleigh road.
	Rocky River Pony Trail.....	13 mi. brushed, graded, and bridges repaired.
	Jacques Lake Pony Trail.....	Bridge constructed at Mile 22·5.
	Jasper Townsite – Mina Lake and Riley Lake.....	12-ft. pony trail constructed.

3. Improvements to Trails—(Cont'd.)

National Park	Location	Work
KOOTENAY.....	Helmet Creek.....	New trail constructed to connect Ochre Creek Trail with Upper Wolverine Pass Trail.
YOHO.....	Ottertail Valley.....	4.2 mi. fire road constructed, 30-ft. bridge constructed over Float Creek.
	Lake O'Hara Fire Road.....	40-ft. bridge replaced.
	Otterhead Fire Road.....	Decking replaced in bridge at Mile 1.5.
PRINCE ALBERT.....	Boundary Trail.....	13 mi. graded, widened, and gravelled.
	Moose Trail.....	15 mi. widened and graded.
	Elk Trail.....	6 mi. graded and widened.
	Fish Lake Trail.....	6 mi. graded and widened.
	Beartrap Trail.....	3 mi. graded and widened.
RIDING MOUNTAIN.....	Rat Lake Creek.....	4 mi. fire trail constructed from Mile 5 on the Rolling River road.
	Animal Enclosure.....	12 mi. fire trail west graded, gravelled, and culverts installed.
	Lake Audy.....	3 mi. fire trail south improved.
FUNDY.....	Shepody Trail.....	8,500 cu. yd. gravel placed in completing 3 mi. of construction.
	Forty-five Trail.....	9,000 cu. yd. of gravel placed and 3 mi. of construction completed.
	Goose River Trail.....	One mile of trail cut out.
CAPE BRETON HIGHLANDS.	Cheticamp.....	5 mi. new trail constructed.

4. Mileage of Park Roads, Trails, and Telephone Lines

National Parks	Motor Roads	Secondary Roads	Fire Roads	Trails	Telephone Lines
Banff.....	179.45	—	125.00	702.25	277.75
Cape Breton Highlands.....	53.97	6.26	23.87	21.67	14.34
Elk Island.....	18.00	—	—	20.00	22.50
Fundy.....	19.60	—	21.10	25.70	13.50
Georgian Bay Islands.....	—	—	11.25	16.25	—
Glacier.....	—	—	25.75	106.50	2.00
Jasper.....	146.50	20.00	90.00	601.50	382.85
Kootenay.....	60.60	—	46.00	138.00	63.10
Mount Revelstoke.....	18.50	—	—	58.25	8.25
Point Pelee.....	11.50	2.00	2.00	1.25	—
Prince Albert.....	65.70	75.75	—	268.75	161.00
Prince Edward Island.....	11.15	4.85	—	—	—
Riding Mountain.....	74.30	11.90	44.00	10.00	140.50
Waterton Lakes.....	43.80	13.50	29.00	83.00	60.00
Yoho.....	45.00	—	33.70	246.50	73.00
TOTAL.....	748.07	134.26	451.67	2,299.62	1,218.79

5. Major Construction in Parks

National Park	By National Parks Branch	By Private Enterprise
BANFF.....	New residential quarters at Cave and Basin bathhouse completed; steam rooms and showers at Upper Hot Springs tiled and new boiler installed; public convenience building in Central Park; staff residence for Assistant Superintendent; single staff residence, duplex residence, and three-car garage for Engineering staff; warden patrol cabins were built on the Panther River, Castle-guard River, and at Camp Parker; 600 feet wrought-iron fencing installed on stonework erected at Administration Building last year.	(a) <i>Townsite</i> : 47-unit motel; 27-room hotel; two double and one triple addition to a motel; post office building and soils laboratory constructed by Department of Public Works. (b) <i>Outside townsite</i> : 11-unit motel; work continued on 23 buildings for the National Cadet Camp (Department of National Defence); ski-lift at Sunshine Village.
JASPER.....	Two-car garage for staff residences; warden cabin in Whirlpool district; two log shelter cabins; the ventilating system installed in quonset hut No. 40.	Apartment building Lot 7, Block 8; addition to a hotel; telephone exchange building (erected by Alberta Government Telephones).
KOOTENAY.....	Maintenance garage and central stores and workshops at McKay Creek Industrial Compound; office building and staff quarters at western entrance; warden cabin at Marble Canyon.	Office and staff quarters at a bungalow camp.
WATERTON LAKES.....	Construction of new Belly River bridge completed, and the new residence for the Superintendent constructed.	
YOH0.....	Addition to Park Administration Office and renovation to old part of building completed; a new steel truss bridge completed on the Yoho Valley road.	Lobby of hotel at Field remodelled; main floor of lodge at Lake Wapta remodelled.
MOUNT REVELSTOKE.....	Balsam Lake Patrol cabin.	
PRINCE ALBERT.....	Semi-detached staff residence at Waskesiu Townsite.	Motel; 2 additional bungalow cabins.
RIDING MOUNTAIN.....	Park Administration Building; warden residence; 4 combined garages and workshops at warden stations.	6 cottages; 3 garages.
GEORGIAN BAY ISLANDS....	Warden residence; combined workshop, storage and garage building.	
CAPE BRETON HIGHLANDS...	Two-car garage; Industrial Compound was fenced.	Caretaker's residence at Keltic Lodge.
ELK ISLAND.....	Duplex staff residence; west gate registration office; warden cabin at Oster Lake; refreshment booth at Sandy Beach.	
FUNDY.....	Canteen at swimming pool; concrete floor laid in fire shed.	
ST. LAWRENCE ISLANDS....	Combined workshop and stores building completed at Mallorytown Landing.	

6. Improvements to Townsites

National Park	Location	Work
BANFF.....	Moose Street.....	Curb and gutter installed east of Banff Avenue.
	Elk, Wolf, and Grizzly Streets....	Curb and gutter extended east of Banff Avenue.
	Banff School of Fine Arts.....	1,000 ft. 6 in. water main installed.
	Marmot Street.....	Telephone lines relocated to Badger and Cougar Streets.
	Fox Street.....	Telephone lines relocated.
JASPER.....	Patricia and Miette Streets.....	Sidewalks asphalt surfaced.
Yoho	Stephen Avenue.....	New broadwalk constructed.
	Kicking Horse Avenue.....	New section cement sidewalk laid.
PRINCE ALBERT (Waskesiu)	Montreal Drive.....	Sidewalk constructed in front of new staff residences.
FUNDY.....	Park headquarters.....	1,412 ft. of curb and gutter laid on Church Hill and on Route No. 14.

7. Additions to Recreational Facilities

National Park	Location	Additions
BANFF.....	Tunnel Mountain camp-ground....	4 old shelters replaced.
	Waterfowl Lake and Moraine Lake camp-grounds.....	Gravity water systems installed.
	Johnson Canyon camp-ground....	New permanent film screen.
JASPER.....	Whistler Mountain.....	Ski lodge and tea room.
	Miette Hot Springs.....	Repairs to bath-house.
KOOTENAY.....	Aquacourt.....	Fibre glass diving board; heated walkway leading to hot pool installed.
WATERTON LAKES.....	Main camp-grounds.....	New kitchen shelter.
	Trailer Park.....	Additional water and electrical outlets installed.
ELK ISLAND.....	Park Headquarters.....	Bowling green.
PRINCE ALBERT.....	Recreational area.....	2 new horseshoe pits installed.
	Narrows Camp-ground.....	Kitchen shelter erected.
CAPE BRETON HIGHLANDS...	Ingonish Beach.....	New diving float.
PRINCE EDWARD ISLAND...	Stanhope Camp-grounds.....	New kitchen shelter erected; toilet and laundry building completed; underground electric connections for trailers installed; water lines and pumps installed at tenting area, bath-house constructed.

7. Additions to Recreational Facilities—(Cont'd.)

National Park	Location	Additions
POINT PELEE.....	4½ mi. south of Park entrance.....	Consolidated camp-ground with space for 15 trailers and 125 tents opened on May 1. Facilities include kitchen shelters, comfort stations, laundry facilities, and electricity.
	West beach.....	Work completed on beach protection.
ST. LAWRENCE ISLANDS.....	Mallorytown Landing, Beau Rivage, Endymion, Georgina, and Gordon islands.....	Camp-stoves constructed, wells drilled.
	Georgina Island.....	New wharf constructed.

8. Fire Losses in the National Parks

National Park	Number of fires		Area burned (Acres)		Cost of suppression (Dollars)	
	1950-54 Av.	1955	1950-54 Av.	1955	1950-54 Av.	1955
Banff.....	10.0	5	22.6	0.1	909.01	184.40
Jasper.....	3.6	1	2.9	0.1	299.75	1.30
Glacier.....	2.4	7	62.3	0.2	592.48	631.49
Kootenay.....	1.2	1	spot	spot	33.69	14.20
Yoho.....	1.8	12	1.1	886.8	614.15	17,638.52
Revelstoke.....	1.2	2	1.2	.1	284.88	224.33
Waterton Lakes.....	0.6	0	0.2	0.0	4.00	—
Elk Island.....	0.2	0	30.0	0.0	15.74	—
Prince Albert.....	1.6	3	3,820.9	5.25	1,705.05	913.44
Riding Mountain.....	2.4	4	125.5	325.0	400.64	352.00
Georgian Bay Islands.....	0.6	1	spot	spot	0.31	—
St. Lawrence Islands.....	1.4	4	0.3	2.25	8.50	57.00
Point Pelee.....	0.2	0	spot	0.0	1.25	—
Fundy.....	0.6	0	9.0	0.0	508.60	—
Prince Edward Island.....	0.0	3	0.0	0.4	—	6.00
Cape Breton Highlands.....	1.6	0	0.4	0.0	30.89	—
TOTAL.....	29.4	43	4,076.4	1,220.2	5,408.94	20,022.68

9. Reduction of Mammals

National Park	Mammal	Number Killed	Disposal of Meat and Hides
BANFF.....	Buffalo	6	Meat and hides donated to Banff.
	Elk	6	Indian Days Committee.
JASPER.....	Elk	145	Meat and hides donated to Indian Affairs Branch.
ELK ISLAND.....	Buffalo	501	Meat and hides sold.
	Elk	76	Meat and hides donated to Indian Affairs Branch.
	Moose	24	
PRINCE ALBERT.....	Beaver	2,415	Trapping carried out by Indians.
	Muskrat	543	
	Mink	20	
	Otter	1	
POINT PELEE.....	Muskrat	7,000	Hides sold by tender.
	White-tailed deer	9	Meat given to charitable institutions.

10. Statement of Large Mammals in Fenced Enclosures in National Parks

	Buffalo	Elk	Moose	Mule Deer	White-tailed Deer	Total
Banff Park Paddock.....	7	—	—	—	—	7
Elk Island Park Paddock.....	919	441	285	30	45	1,720
Prince Albert Park Paddock.....	11	—	—	—	—	11
Riding Mountain Park Paddock..	36	191	3	—	37	267
Waterton Lakes Park Paddock...	19	—	—	—	—	19
TOTAL.....	992	632	288	30	82	2,024

11. Comparative Statement of Attendance at National Park Bathing Establishments

National Park	Name of Pool	1955-56	1954-55
Banff.....	Upper Hot Springs.....	145,782	141,957
	¹ Cave and Basin.....	121,721	98,720
Jasper.....	¹ Miette Hot Springs.....	40,536	24,645
	¹ Jasper Townsite Pool.....	21,767	16,288
Kootenay.....	Radium Hot Springs Aquacourt.....	165,431	145,858
Fundy.....	¹ Fundy Park Pool.....	18,984	14,728

¹ open in summer only.

12. Members of Historic Sites and Monuments Board

Professor Fred Landon, London, Ont. (Chairman).

The Honourable E. Fabre Surveyer, Montreal, Que.

The Reverend Antoine d'Eschambault, Genthon, Man.

Professor M. H. Long, Edmonton, Alta.

Dr. Walter N. Sage, Vancouver, B.C.

The Honourable Thane A. Campbell, Charlottetown, P.E.I.

Dr. Wm. Kaye Lamb, Dominion Archivist, Ottawa, Ont.

C. E. A. Jeffery, Esq., St. John's, Nfld.

Dr. Alfred G. Bailey, Fredericton, N.B.

Richmond Mayson, Esq., Prince Albert, Sask.

Dr. F. J. Alcock, Chief Curator, National Museum, Ottawa, Ont.

C. Bruce Fergusson, Esq., Halifax, N.S.

H. J. W. Walker, Esq., Ottawa, Ont.

Edouard Fiset, Esq., Quebec, P.Q.

A. J. H. Richardson, National Historic Sites Division, Ottawa, Ont.
(Secretary).

13. Major Improvements and Repairs to National Historic Parks and Sites

National Historic Site	Nature of Work
Fort Battleford, Sask.....	A workshop and garage constructed; some landscaping undertaken.
Fort Malden, Amherstburg, Ont.....	A commencement made on extension to boundary fence; new heating unit installed in museum building; repair work and decorating undertaken in Custodian's residence.
Woodside, Kitchener, Ont.....	An access road and public car-parking area constructed.
Fort Chambly, Que.....	A new furnace acquired.
Fort Wellington, Ont.....	A commencement made on proposed replacement of entire palisades at this Fort.
Fort Anne, N.S.....	A residence constructed for the Park Custodian.
Port Royal, N.S.....	A well drilled; a pumphouse constructed; and a water system installed, completion of entrance, road gateway, landscaping, and relocation of power and telephone lines.
Alexander Graham Bell Museum, Baddeck, N.S.....	This building constructed; commencement made on new access road; parking area, and installation of sewer and water services; some work undertaken on landscaping and construction of stone retaining walls.
Fortress of Louisbourg, N.S.....	Continuation of excavation work; entrance road to the museum paved; commencement made on two-year program of retracing part of old fort road system; some work on shore protection.
Quebec Walls and Fortifications.....	Continuation of repointing and rebuilding walls undertaken.
Halifax Citadel.....	Reconstruction of walls at citadel continued, including repointing, restoration of casemates, and dungeon; repairs also undertaken to administration building and water system installed for fire protection purposes.
Fort Edward Blockhouse, Windsor, N.S....	Commencement made on erecting of split logs to exterior of Blockhouse; window and door frames replaced.

14. Historic Sites Marked and Important Persons Commemorated

Place	Event or Person
NEWFOUNDLAND—	
St. John's.....	Winning of Responsible Government.
PRINCE EDWARD ISLAND—	
Charlottetown.....	Sir Andrew Mcphail.
New Glasgow.....	Honourable David Laird.
NOVA SCOTIA—	
Port Royal.....	Champlain's Habitation.
NEW BRUNSWICK—	
Fredericton.....	First Astronomical Observatory.
Memramcook.....	Sir Pierre Armand Landry.
QUEBEC—	
St. Eloi.....	Honourable Ernest Lapointe.
Quebec.....	Food and Agriculture Organization.
Giffard.....	Robert Giffard.
ONTARIO—	
Toronto.....	First Bird Banding in Canada.
Listowel.....	Horatio Walker.
Grimsby.....	Engagement at the Forty.
Doon.....	Homer Watson.
Ottawa.....	Meetings of Parliament in National Museum.
MANITOBA—	
Winnipeg.....	Lord Selkirk.
SASKATCHEWAN—	
Indian Head.....	Territorial Grain Growers Association.
Meadow Lake.....	Peter Fidler.
ALBERTA—	
Edmonton.....	Creation of the province of Alberta.
Peace River.....	Sheridan Lawrence.
Banff.....	John Murray Gibbon.
Magrath.....	The Magrath Head Gates.
BRITISH COLUMBIA—	
Trail.....	Industry at Trail.

15. Banding of Wild Birds

Species	Number
Banded in 1955—	
Ducks.....	34,561
Geese.....	834
Trumpeter Swans.....	30
Whistling Swans.....	1
Other Migratory Birds.....	37,401
TOTAL, 1955.....	72,827
Banded to date.....	959,609
Banded birds recovered to date.....	88,341
(This total includes birds banded in Canada and recovered in Canada or elsewhere; also records of birds banded elsewhere than in Canada and recovered in this country.)	

16. Licences and Permits Issued Under the Migratory Birds Convention Act

Nature of Permit or Licence	Number Issued
To collect birds for scientific purposes.....	429
For local control of Great Black-backed Gull.....	0
To take migratory birds for propagation.....	5
To possess migratory birds for propagation.....	768
For bird-banding.....	194
For taxidermy.....	62
Total.....	1,458

17. Distribution of Wildlife Publications

Publication	Number Issued
Consolidation of Migratory Birds Convention Act and Regulations.....	10,800
Abstracts of Migratory Bird Regulations.....	21,905
Educational and Instructive Pamphlets.....	19,901

18. Zoological Studies by National Museum

Area	Study
Newfoundland.....	Black bears
Labrador Coast.....	Mammals
Prince Edward Island.....	Fauna
Nova Scotia.....	Amphibians and reptiles; fauna
New Brunswick.....	Amphibians and reptiles
Quebec—	
Southern parts.....	Birds
Saskatchewan.....	Wildlife habitats—fossil crocodiles, dinosaurs, tertiary mammals
Alberta.....	Wildlife habitats
Red Deer River Badlands.....	Dinosaur remains
British Columbia.....	Marine invertebrates
Northwest Territories—	
Ellesmere Island.....	Birds, mammals, marine invertebrates

19. Specimens Added to the Zoological Collections

301	mammals
1,105	birds
650	reptiles and amphibians
22	lots of fishes
1,332	lots of invertebrates
ca. 375	identifiable fossil vertebrates

20. Institutions Which Received Information or Specimens from the National Museum

(a) *Archæological:*

Arctic Institute of North America, 3485 University St., Montreal, Que.; Canadian Board on Geographical Names, Ottawa, Ont.; Dartmouth College, Hanover, N.H.; Denver Museum of Natural History, Denver 6, Colo.; Glenbow Foundation, Calgary, Alta.; Robert S. Peabody Foundation for Archæology, Andover, Mass.; Instituto Interamericano, Denton, Tex.; Laval University, Quebec City; Lethbridge Collegiate Institute, Lethbridge, Alta.; Museum of Anthropology, University of Michigan, Ann Arbor, Mich.; Museo de Ciencias Naturales, Caracas, Venezuela; New Brunswick Museum, Saint John, N.B.; Osborn Zoological Laboratory, Yale University, New Haven, Conn.; Peabody Museum, Cambridge 38, Mass.; Province of Saskatchewan (Department of Natural Resources), Regina, Sask.; Provincial Museum, Victoria, B.C.; Royal Ontario Museum (Division of Art and Archæology), Toronto, Ont.; Saskatchewan Museum of Natural History, Regina, Sask.; Washington State Museum, University of Washington, Seattle 5, Wash.; University of British Columbia (Museum of Anthropology), Vancouver 8, B.C.; University of British Columbia (Department of Geology and Geography), Vancouver 8, B.C.; University Museum of Archæology and Ethnology, Cambridge, England; University of Minnesota (Minnesota Museum of Natural History), Minneapolis 14, Minn.; University of Pennsylvania (Department of Anthropology), Philadelphia, Pa.; University of Texas (Department of Anthropology), Austin, Tex.; University of Western Ontario, London, Ont.

(b) *Ethnological:*

L'Académie des Arts, Sciences et Lettres, Lyon, France; Académie Canadienne-française, Montreal, Que.; American Men of Science (Encyclopedia), Lancaster, Pa.; Archives of Society for the Propagation of the Gospel, London, England; The American Museum of Natural History, New York City; The American Oxonian, Wilson College, Chambersburg, Pa.; Canadian Association for Adult Education, Toronto, Ont.; Canadian Board on Geographic Names, Ottawa, Ont.; Canadian Broadcasting Corporation, Montreal, Que., Toronto, Ont.; Canadian Citizenship Branch, Ottawa, Ont.; Canadian Handicrafts Guild, Montreal, Que.; Canadian National Railways System, Montreal, Que.; Canadian Pulp and Paper Association, Montreal, Que.; Canadian Social Science Research Council, New York City; Christ Church Cathedral, Dublin, Ireland; Columbia Records of Canada Ltd., New York City; Composers, Authors, and Publishers Association, Toronto, Ont.; Conseil de la Vie française, Quebec City; Conservatoire national de musique et d'art dramatique, Lyon, France; Consolidated Paper Corp. Ltd., Montreal, Que.; Crawley Films Ltd., Ottawa, Ont.; The Canadian Geographical Society, Ottawa, Ont.; The Canadian Medical Association, Toronto, Ont.; The Clarendon Press, Oxford, England; The Congress of Americanists, Copenhagen, Denmark; Department of Citizenship and Immigration, Ottawa, Ont.; Department of External Affairs, Ottawa, Ont.; Department of National Defence, Ottawa, Ont.; Department of Protestant Education, Quebec City; Detroit Historical Museum, Detroit, Mich.; The Denver Art Museum, Denver, Colo.; Encyclopedia of Canada, Ottawa, Ont.; Eldorado Mining and Refining Limited, Eldorado P.O., Sask.; Ethnic Folkways Library, New York City; Fathers of the Holy Cross, Moncton, N.B.; Fathers of the Holy Ghost, Montreal, Que.; First Presbyterian

Church, St. Helena, Calif.; Folkways Records and Service Corp., New York City; Frank W. Honner Ltd., Pharmaceuticals, Montreal, Que.; French-Canadian Protestant Forum, Ottawa, Ont.; Gillies Bros. & Co., Ltd., Braeside, Ont.; The Grolier Society Inc., New York City; The Grolier Society of Canada Limited, Ottawa, Ont.; Holy Cross Hospital, Drummondville, Que.; House of Commons, Quebec City; Hudson's Bay Company, Winnipeg, Man.; Indian Affairs Branch, Ottawa, Ont.; Institut canadien-français, Ottawa, Ont.; Institute for Research in Social Science, University of North Carolina, Chapel Hill, N.C.; International Folk Music Council, London, England; Jeunesses Musicales, Montreal, Que.; The Journal of American Folklore, Philadelphia, Pa.; Kingston University, Kingston, Ont.; Laval University, Quebec City; Librairie Hachette, Paris, France; L'Ordre de Bon Temps, Montreal, Que.; Michigan Folklore Society, Ann Arbor, Mich.; Michigan State College, East Lansing, Mich.; Montevideo Museum, Montevideo, Uruguay; Montreal University, Montreal, Que.; Musée national des arts et traditions populaires, Paris, France; National Folk Festival by St. Louis Globe-Democrat, St. Louis, Mo.; Native Community Development Bureau, Ottawa, Ont.; Norwegian Broadcasting Corporation, Oslo, Norway; The National Film Board of Canada, Ottawa, Ont.; The National Gallery of Canada, Ottawa, Ont.; Oblate Fathers, Ottawa, Ont.; Oxford University, Oxford, England; Pitt Rivers Museum, Oxford, England; Public Archives, Ottawa, Ont.; The Peabody Museum, Salem, Mass.; R.A.F. College of Arms, London, England; R.C.A.F. College of Arms, Ottawa, Ont.; R.C.A.F. Headquarters—Air Technical Services, Ottawa, Ont.; Royal Ontario Museum, Toronto, Ont.; Royal Society of Canada, Ottawa, Ont.; Smith College, Northampton, Mass.; Société des Ecrivains canadiens, Montreal, Que.; Société des Obstétriciens et Gynécologues du Canada, Quebec City; La Société Historique du Saguenay, Chicoutimi, Que.; University of Ottawa, Ottawa, Ont.; University of Toronto, Toronto, Ont.; The University Museum, University of Pennsylvania, Philadelphia, Pa.; The University College of North Staffordshire, Keele, Staffordshire, England; Van Blaricom & Woolard, Barristers, Solicitors, Notaries, Tisdale, Sask.

(c) *Zoological:*

Canadian Wildlife Service; Educational Division, Northern Administration; Geological Survey of Canada; National Film Board; Science Service, Department of Agriculture, Ottawa and Brandon; Fisheries Research Board of Canada; National Research Council; Grolier Society of Canada; Arctic Institute of North America; "The Canadian Field-Naturalist"; Canadian Museums Association; Canadian Geographical Society; Carleton College, Ottawa; Colour Photography Society of Canada; Royal Ontario Museum; Department of Biology, Queen's University; Department of Zoology, and Redpath Museum, McGill University; University of Montreal; Granby Zoological Gardens; Argenteuil Historical Society; Nova Scotia Museum of Science; University of Manitoba; "The Beaver" magazine, Winnipeg; Forest Research Laboratory, Winnipeg; Saskatchewan Museum of Natural History; University of Alberta; British Columbia Museum of Natural History and Anthropology; Pacific Biological Station, Nanaimo; United States National Museum; American Museum of Natural History; University of Connecticut; University of Massachusetts; Department of Zoology, Boston University; University of Delaware; Philadelphia Zoological Society; Cornell University; Department of

Geology, Princeton University; Cleveland Museum of Natural History; Chicago Natural History Museum; Tulane University, Louisiana; Colorado School of Mines; University of Utah; Texas Agricultural and Mechanical College; University of Southern California; Institut für Haustierkunde, Kiel, Germany.

(d) *National Herbarium:*

Federal Government Services: Department of Agriculture, including Science Service; Forestry Branch; Archæology and Zoology Sections of the National Museum; Geographical Bureau; Dominion Archives; National Film Board; Wildlife Service; Northern Administration; Geological Survey, Department of Mines and Technical Surveys; National Research Council; Department of National Defence. *Provincial Services:* Ontario Department of Lands and Forests. *Canadian Universities and Scientific Institutions:* Agricultural College, Rimouski; University of Montreal; McGill University; Montreal Botanical Garden; Nova Scotia Museum of Science; Acadia University; University of Toronto; Guelph Agricultural College; Arctic Institute of North America; Western University; University of Manitoba; University of Alberta; University of British Columbia; Mount Allison University; Mont Sacré-Cœur; Royal Society of Canada. *United States Universities and Scientific Institutions:* Duke University; Catholic University, Washington, D.C.; University of Massachusetts; University of Michigan; University of Minnesota; University of Illinois; University of California; Stanford University; University of Idaho; Emory University; University of Wichita; DePauw University; Southern Methodist University; State University of Florida; University of Tennessee; University of Washington; Ohio State University; West Virginia University; University of Wisconsin; University of Cincinnati; University of Colorado; Dartmouth College; University of Utah; University of Alaska; Hunter College; Flint Junior College; Tougaloo College; North Dakota Agricultural College; William Jewell College; Missouri Botanical Garden; New York Botanical Garden; American Philosophical Society; Smithsonian Institution; American Institute of Biological Sciences; Farlow Herbarium, Harvard University; Gray Herbarium, Harvard University; Harvard Forest of Harvard University; U. S. National Herbarium; Philadelphia Academy of Natural Sciences; Woods Hole Biological Station. *Commonwealth and Foreign Universities and Scientific Institutions:* Botanical Museum, University of Copenhagen; Marine Biological Station, Copenhagen; Technical Institute, Copenhagen; British Museum (Natural History); Royal Botanic Gardens, Kew; University of Aberdeen; Cambridge University; University of Glasgow; Oxford University; University of Helsingfors, Finland; Botanical Museum, Oslo, Norway; National Museum, Stockholm, Sweden; University of Uppsala, Sweden; University of Denmark; National Museum of France; Institute of Jamaica; University College of the West Indies; University College of Nigeria; Punjab University; University of Utrecht; Slezské Museum, Opava, Czechoslovakia; University of Czechoslovakia; Komarov Botanical Institute, Leningrad, U.S.S.R.; Hattori Botanical Laboratory, Japan; Imperial University, Sapporo, Japan; Hiroshima University; Lunds Universitets Institut; Commonwealth Scientific and Industrial Research, Division of

Plant Industries, Canberra, Australia. *Miscellaneous*: Ninth International Botanical Congress; International Society of Plant Taxonomists, Utrecht, Netherlands; Greenland Administration; U. S. Geological Survey; Glenbow Foundation; *Chronica Botanica*; U. S. Naval Research; British Book Service; Canadian Encyclopedia; Ottawa Field-Naturalists' Club; Hudson's Bay Co.; Spruce Falls Pulp and Paper Co.

21. National Museum Lectures

(a) *Adult Lectures*—

- Trees of Canada, by D. A. Macdonald, B.Sc., L.L.D., Ottawa.
Mankind Around the World, by T. F. McIlwraith, M.A. (Cantab.), F.R.S.C., Toronto.
Life on a Coral Reef, by John F. Storr, M.A., Ph.D., Miami, Fla.
From the Pyrenees to Paris, by Neil Douglas, Meriden, Conn.
The White Continent, by E. F. Roots, Ph.D., Ottawa.
The Living Desert—a motion picture by Walt Disney.
Botanical Mysteries, by Hugh M. Raup, A.M., Ph.D., Cambridge, Mass.
African Excursion, by Kenneth E. Eade, Ph.D., Ottawa.
Power from the St. Lawrence, by C. G. W. MacIntosh, Cornwall.
Life within the Honeybee Colony, by C. A. Jamieson, B.Sc., Ph.D., Ottawa.
Early Man in Ontario, by Thomas E. Lee, M.A., Ottawa.
Helicopters over the Arctic, by Y. O. Fortier, M.Sc., Ph.D., Ottawa.
Domes Against the Sky, by Peter M. Millman, A.M., Ph.D., Ottawa.
The Ancient World: Egypt—a motion picture by Ray Garner.
The Canadian Wildlife Service, by Victor E. F. Solman, M.A., Ph.D., Ottawa.
Peaceful Applications of Atomic Energy, by Clyde Kennedy, B.Sc., Chalk River.
Wildflowers along New England Trails, by Raymond D. Wood, M.A., J.D., A.R.P.S., Mount Kisco, N.Y.

(b) *Adult Lectures in French*—

- Regards sur l'Afrique noire, by Eugène Bussière, Ottawa.
Le Cambodge et nos amis les Cambodgiens, by Alexandre J. Boudreau, Ottawa.

(c) *Children's Lectures*—

- Bear Country—a motion picture by Walt Disney.
Snakes and What They Eat, by J. S. Bleakney, National Museum.
All the King's Horses—a film program.
Hunting with a Camera, by S. D. MacDonald, National Museum.
All about Australia—a film program.
Sea Island—a motion picture by Walt Disney.
Children of Other Lands, by the Citizens' Committee on Children, Ottawa.
Nanook of the North—a film on Eskimo Life.

The Great Adventure—a nature film.

Hunting for Minerals, by S. C. Robinson, Ph.D., Ottawa.

All about Dinosaurs, by W. Langston, Ph.D., National Museum.

Life within the Honeybee Colony, by C. A. Jamieson, Ph.D., Ottawa.

From the Canoe to the Airplane, by F. J. Alcock, Ph.D., Chief Curator, National Museum.

A Journey to the Antarctic, by E. F. Roots, Ph.D., Ottawa.

All about New Zealand—a film program.

Animals of Canada's Arctic, by Victor E. F. Solman, Ph.D., Ottawa.

Canada's Natural Zoo, by L. E. Pelton, B.Sc.F., Ottawa.

Sheep Dog, Police Dog—a film program.

Salute to the Boy Scouts—a film program.

(d) *Special Programs—*

The Expanding Universe, by Sir Harold Spencer Jones, Astronomer Royal, London, England.

Canadian Film Awards—1954, by the Canadian Film Institute, Ottawa.

Peruvian Films, by the Peruvian Embassy, Ottawa.

Folk Music of Peru, by Oscar H. Alcazar, Lima, Peru.

English Folk Songs in The Old and New Worlds, by Maud Karpeles, London, England.

The Great Adventure—a prize-winning Swedish film.

Canada in Colour—a series of films in colour on the Canadian scene presented to Museum visitors during July and August from 3.00 till 4.00 p.m.

Folksongs of Canada, a half-hour lecture with music preceding the program, "Canada in Colour".

APPENDIX C

1. Details of Stream Gauging

District Office	Gauging Stations	Discharge Measurements	Co-operating Agencies	Special Programs
Vancouver..... (Sub-offices in Kamloops, Nelson, Cranbrook, Prince George, Whitehorse).	360 (223 all year)	1,038	B.C. Water Rights Branch B.C. Power Commission Northwest Power Industries Ltd. B.C. Electric Co. Consolidated Mining and Smelting Co. Ltd. Aluminum Co. of Canada Bonneville Power Administration U.S. Geological Survey Corps of Engineers, U.S. Army	Columbia River investigations. Fraser River basin studies. Fisheries Research. Yukon River investigations.
Calgary..... (Sub-office in Shaunavon).	244 (67 all year)	2,074	Alberta Water Resources and Irrigation Branch Saskatchewan Water Rights Branch Prairie Farm Rehabilitation Administration Calgary Power Limited Consolidated Mining and Smelting Company U.S. Geological Survey	International gauging stations on Milk, St. Mary, and other prairie rivers. General reconstruction of stream gauging structures.
Winnipeg..... (Sub-offices in Keewatin and Fort Frances).	166 (99 all year)	826	Manitoba Water Resources Branch Hydro-Electric Power Commission of Ontario U.S. Geological Survey	International prairie rivers. Installation of new gauge structures and regulation of lakes in Winnipeg River basin.
Ottawa..... (Sub-offices in North Bay and Niagara Falls).	150 (142 all year)	526	Hydro-Electric Power Commission of Ontario Ontario Department of Planning and Development Department of Public Works Great Lakes Power Company Abitibi Power & Paper Co. Northern Quebec Power Co.	Niagara River studies and assistance to international boards. St. Lawrence River meterings.
Montreal.....	173 (130 all year)	411	Quebec Streams Commission Quebec Hydro-Electric Commission Shawinigan Water and Power Company Aluminum Co. of Canada Gatineau Power Company Price Brothers Co. Ltd.	Metering of outflow and rating of storage reservoirs. Checking of power station ratings. International gauging stations on Richelieu and Magog Rivers.
Halifax..... (Sub-office in St. John's, Newfoundland).	42 (37 all year)	214	Nova Scotia Power Commission New Brunswick Electric Power Commission Newfoundland Department of Mines and Resources British Newfoundland Corporation	Discharge measurements and establishment of gauging stations in Hamilton River basin. Re-establishment of gauges following January floods.

2. Run-off Conditions in Canada

District	Mean Run-off	Variations in River Flows
British Columbia.....	103 per cent of yearly median on 5 typical rivers.	Low run-off throughout province during April and May, excessive during summer months, then for balance of year near normal for central and southern regions and below normal for upper coast and Vancouver Island. New daily high record for July on Fraser River. Record low monthly flows for May on Kootenay, Columbia, and Skeena Rivers, and for March on Skeena River. Record low daily flow for May on Skeena River.
Eastern slope Rocky Mountains.	96 per cent for two rivers.	Deficient flows for North Saskatchewan River during summer and autumn months and for Bow River in May. High discharges on North Saskatchewan River in April and May. Record low monthly flows for May on Bow River and for August on North Saskatchewan River.
Southern Alberta and southwestern Saskatchewan.	.....	Run-off above normal throughout season with record spring flows.
Manitoba.....	460 per cent of median for one river.	Run-off for the Assiniboine River in March was excessive for the 22nd consecutive month. New high records of monthly flows for April and June, and of daily flows for June and July. Red River below normal except for month of August. Saskatchewan River moderately above normal for year. Churchill and Nelson Rivers well above normal. Manitoba lakes at high levels with record highs for month of June.
Northwestern Ontario..	85 per cent of median for one river.	Low flow in English River during midsummer and high for other months.
James Bay Drainage....	71 per cent for 2 rivers.	Missinaibi River excessive in April, low throughout summer with record monthly low for September. Harricana River deficient during summer months with record monthly lows for June and September, and daily low for August and September.
Great Lakes.....	86 per cent for 4 rivers.	Record low monthly flows in Aux Sables River for June, July, and August, and daily lows for May, July, and August. Record low monthly flow for May on North Magnetawan River. Record low monthly flows in Saugeen River for August and September, and daily lows for August and October. Moirs River generally low or deficient except for high flows in April, and excessive flows in October and November. Record high monthly flow for October.
Quebec.....	80 per cent for 3 rivers.	Run-off was generally well below normal with record low monthly flows in the St. François River for July and December, and the Outardes River for September, also record daily lows in the St. François River for July and in the Outardes River for August and September.

2. Run-off Conditions in Canada—(Cont'd.)

District	Mean Run-off	Variations in River Flows
New Brunswick.....	80 per cent for 2 rivers.	Saint John River flows were excessive in April but deficient during July and October to December. The discharge of the Lepreau River was deficient during May to July and October to December but excessive in January.
Nova Scotia.....	98 per cent for 2 rivers.	Run-off was generally below normal and was deficient in April, July, October, and December. Heavy precipitation resulted in record high monthly mean and daily flows for January on the St. Mary and Lehave Rivers.
Newfoundland.....		Based on a six-year record, run-off varied between sub-normal and normal during spring, summer and autumn months; was higher than normal in January and normal during February and March.

3. Snow Surveys

District	Location	Co-operating Agency	Average Water Content of Snow Cover
Calgary.....	St. Mary River basin (May 1955)	U.S. Geological Survey.	Over 20% above 33-year average
	Bow River basin (Mar. 1956)	—	167% of 19-year average
	Cypress Hills	—	High
	North Saskatchewan River	—	(New survey conducted)
Winnipeg.....	Lake of the Woods basin (Jan., Feb., Mar.)	U.S. Corps of Engineers.	131 % of normal
	Lac Seul	Hydro-Electric Power Commission of Ontario	159 % of normal
		Hydro-Electric Power Commission of Ontario	
Ontario.....	North-central region—6 courses	Hydro-Electric Power Commission of Ontario	Below 18-year average in Muskoka River basin, moderately above average in other areas.
New Brunswick.	Saint John and Lepreau river basins—10 courses	N.B. Electric Power Commission	6.9 in.
Nova Scotia....	From Barrington to Antigonish—10 courses	—	5.8 in.

4. Boards on Which Water Resources Branch Has Membership

Board	Purpose	Details of Operation
NATIONAL—		
Canadian Lake of the Woods Control Board	To supervise water levels.....	Supervised the operation of control structure, compiled records.
Prairie Provinces Water Board	To study the interprovincial waterway problems of the three prairie provinces.	Participated in studies of current and future water requirements.
Fraser River Board.....	To study measures of control and use of the water resources of the Fraser River Basin.	Participated in preparation and review of interim flood control report and continued co-operative hydrometric survey program.

4. Boards on Which Water Resources Branch Has Membership (Cont'd.)

Board	Purpose	Details of Operation
INTERNATIONAL—		
St. Croix River Board of Control	To supervise water levels.....	Maintained records of levels and inspected control structures.
Lake Memphremagog Board	To supervise water levels.....	Maintained records of levels.
Lake Champlain Board of Control	To supervise water levels....	Maintained records of levels.
St. Lawrence River Board of Control	To supervise control of outflow from Lake Ontario.	Approved plans and specifications for works in International Rapids Section of the St. Lawrence, in so far as those works would affect the levels and flow of the St. Lawrence River and Lake Ontario.
Massena Board of Control.....	To supervise maintenance of weir diversion of water from St. Lawrence River by the St. Lawrence River Power Company.	Inspected control structure, and maintained records.
Niagara Board of Control.....	Supervise water levels and the construction of remedial works at Niagara Falls.	Maintained close check on water levels above falls, approved plans and specifications for remedial works, inspected construction of such works.
International Niagara Committee	Determine water available for power under Niagara Treaty of 1950.	Compiled records.
Lake Superior Board of Control	To supervise water levels....	Supervised the operation of control structure, compiled records.
Prairie Portage Board of Control	To supervise water levels....	Project has not been completed. Board has therefore been inactive.
Rainy Lake Board of Control..	To supervise water levels....	Supervised the operation of control structures, compiled records.
International Lake of the Woods Control Board	To supervise water levels....	Supervised the operation of control structure, compiled records.
Souris River Board of Control.	To determine availability and make allocations of water of the Souris River.	Maintained flow records and records of changes in water licences.
St. Mary and Milk Rivers....	To supervise the division and use of the waters of these rivers.	Maintained and operated gauging stations, compiled records.
Kootenay Lake Board of Control	To supervise water levels.....	Inspection of structure, supervision of operation of Corra Linn dam.
Columbia River Board of Control	To supervise water levels....	Maintained records of water level of Columbia River at International Boundary.
Osoyoos Lake Board of Control	To supervise water levels....	Inspection of lake, recording of levels.
St. Croix River Engineering Board	To study the water resources of the St. Croix River Basin	Board established August 31, 1955.

4. Boards on Which Water Resources Branch Has Membership (Cont'd.)

Board	Purpose	Details of Operation
<i>INTERNATIONAL—concluded</i>		
Saint John River Engineering Board	To study the water resources of the Saint John River Basin	Maintained a watching brief on developments in the Saint John River Basin.
Lake Ontario Board of Engineers	To study factors affecting the levels of Lake Ontario and to make recommendations as required under reference of 25 June, 1952	Studied factors affecting the levels of Lake Ontario, developed several regulation plans, metering operations on St. Lawrence River.
Co-ordinating Committee on Great Lakes Basic Hydraulic and Hydrologic Data	To secure international agreement on basic data related to the Great Lakes Drainage Basin	Continued to work toward agreement on basic flow data, crustal movement and basic hydrologic and hydraulic data.
Souris-Red Rivers Engineering Board	To study water resources of Souris and Red Rivers and make recommendations thereon to the International Joint Commission	Made studies of various proposals for allocation of waters of the Souris River.
Waterton-Belly Rivers Engineering Board	To study water resources of Waterton and Belly Rivers and make recommendations to International Joint Commission	Board is inactive at present.
Columbia River Engineering Board	To study water resources of Columbia Basin in order to develop a plan for ultimate use.	Engineering studies for design of dams on Columbia River and tributaries in Canada, also power studies related to various proposed developments. Studies of diversion of Kootenay to Columbia and Columbia to Fraser Rivers are being carried out.
Passamaquoddy Engineering Board	To study tidal power project in Bay of Fundy.	Inactive at present.

5. Developments Under Dominion Water Power Regulations

Development	Date Licensed	Power Output Kwh—1955	Rental Received	Other Details
			\$ cts.	
Porter Creek (Yukon Hydro Co.).....	Mar. 1952	4,087,014	537 85	
McIntyre Creek (Yukon Hydro Co.).....	Mar. 1955	82,000 (approx.)	nil	Interim licence issued. Commenced operation 20 December, 1955.
Lake Minnewanka and Cascades (Calgary Power Ltd.)..	May 1947	72,027,900	9,936 70	Amendment of licence under preparation.
Yellowknife (Con. Mining and Smelting Co.).....	Dec. 1942	25,856,600	3,190 04	
Lake Louise (C.P.R.).....	May 1919	—	—	New licence under preparation.
Ghost (Calgary Power Ltd.)..	May 1947	180,566,400	12,995 05	Federal share of rental collected for Indian Affairs Branch.
Kananaskis (Calgary Power Ltd.).....	Oct. 1912	—	—	Renewal of licence under preparation.
Horseshoe (Calgary Power Ltd.).....	Oct. 1909	—	—	Renewal of licence under preparation.

6. Technical Assistance to Federal Agencies

Agency	Assistance by Water Resources Branch
Department of External Affairs.....	Membership on 4 international boards and provision of technical advice on international waterway problems.
International Joint Commission.....	Membership on 20 international boards and provision of technical advice to these on associated problems.
Department of Fisheries—	
Fish Culture Development Branch.....	Conduct of special hydrometric survey program.
Fisheries Research Board.....	Conduct of special hydrometric survey program.
International Pacific Salmon Fisheries Commission.....	Conduct of special hydrometric survey program.
Department of Agriculture—	
Prairie Farm Rehabilitation Administration..	Co-operation in hydrometric surveys for irrigation purposes.
Department of Public Works.....	Co-operation in hydrometric surveys for regulation of Okanagan Lake and supply of hydrometric survey data.
Department of National Health and Welfare....	Supply of hydrometric survey data.
Department of Northern Affairs and National Resources—	
National Parks Branch.....	Supervision of river diversions in Banff National Park. Supervision of improvements to Lower Fort Garry.
Northern Administration and Lands Branch, Lands Division.....	Administration of certain federal lands in British Columbia.

APPENDIX D

1. Research in the Economics of Forestry

Economic Uses of Yield Data—

A study of the economic uses of yield data was initiated, and a preliminary report on methods of procedure prepared. Money yield tables for one cover type occurring on different sites in two forest regions were drawn up to illustrate the feasibility of producing such tables from the empirical yield tables prepared by the Forest Research Division.

Summary of Forest Legislation—

The study of provincial and federal forest legislation was continued, and a summary for the ten provinces and for federal lands was prepared in article form for later publication. This summary includes a chapter for each province, and also a digest of the principal acts and regulations concerning the Canadian forests.

Analysis of Primary Forest Statistics—

In co-operation with the Forestry Section of the Dominion Bureau of Statistics and the Forestry Study Group of the Royal Commission on Canada's Economic Prospects, a project on analysis of primary forest statistics was carried out. Methods of compiling all primary forest statistics were analysed, and revised systems set up to provide more realistic estimates of forest utilization.

Preparation of International Reports—

Economic and statistical reports were prepared for submission to the Food and Agriculture Organization, the Economic Commission for Europe, and the Organization for European Economic Co-operation. Summaries were made of national and international statistics on production and trade in forest products for the use of Canadian delegates to F.A.O. conferences.

2. Annual Forest Depletion

	Millions of Cu. Ft. of Usable Wood		Percentage of Depletion ¹	
	1944-53	1954 ²	1944-53	1954
Products utilized—				
Logs and bolts.....	1,234	1,478	36.8	39.5
Pulpwood.....	1,017	1,195	30.4	31.9
Fuelwood.....	779	884	23.3	23.6
Other products.....	111	104	3.3	2.8
Total.....	3,141	3,661	93.8	97.8
Wastage—				
By forest fires.....	207	81	6.2	2.2
GRAND TOTAL.....	3,348	3,742	100.0	100.0

¹ Does not include wastage caused by agencies other than fire, such as insects, diseases, and natural mortality, for which no reliable estimates are available.

² Preliminary data.

3. Forest Industries

Summary of Principal Statistics, 1953

	Number of Employees	Salaries and Wages	Net Value of Production ¹	Gross Value of Production
		\$	\$	\$
Woods operations.....	135,981 ²	463,000,000	643,318,339	783,546,958
Pulp and paper industry.....	58,194	235,741,660	599,934,934	1,179,665,443
Lumber industry.....	60,933	142,131,003	269,066,309	580,693,704
Wood-using industries.....	73,377	183,488,249	308,315,617	661,321,108
Paper-using industries.....	26,242	74,366,047	167,338,649	388,585,078
TOTAL.....	354,727	1,098,726,959	1,987,973,848	—

¹ Net value of production is gross or sale value, less cost of materials, fuel, purchased electricity, and process supplies consumed.

² Man-year basis (300 working days).

4. Research Work of Forest Research Division

Silviculture and Management Section

(Percentage figures indicate the approximate allocation of professional time.)

Forest Classification—10%

Further studies of the relative merits of systems of forest site classification which allot different degrees of emphasis to physiographic features, minor forest vegetation, and the forest itself; in the Maritimes emphasis has been on the climax concept, in Quebec on lesser vegetation, in Ontario on physiographic features, and in the Prairie Provinces and Newfoundland various combinations of these approaches are being followed. Revision of *Forest Classification for Canada* continued, as did work on subdividing some of the forest sections into smaller districts.

Ecology and Silvics—20%

Intensive studies under controlled conditions of the differential responses of seedlings of important tree species to variations in moisture, heat, and light; research on frost occurrence and injuries; studies of stand climate and growth response; studies of tree physiology, including the absorption of nutrients by trees and flowering phenomena at the Petawawa Forest Experiment Station. Ecological studies of the following forest types: white spruce, Engelmann spruce, and lodgepole pine in Alberta; spruce-aspen in Manitoba and Saskatchewan; white pine – red pine, and yellow birch – sugar maple in Ontario and Quebec; spruce-balsam in Quebec and the Maritimes; and heath types in Newfoundland. Continuation of work on the preparation of manuals to assist the recognition of forest plants and tree seedlings. Studies of nutrient deficiencies and fertilization experiments with spruce in Quebec.

Applied Silviculture—30%

Cutting experiments in all districts on company lands and on experimental areas administered by the Branch. The principal experiments were with lodgepole pine near Strachan, and white spruce in both the Subalpine and Boreal Forest Regions of Alberta; jack pine and red pine

at Sandilands, black spruce at Duck Mountain, and white spruce – aspen at Riding Mountain, in Manitoba; spruce-balsam-birch-aspen at Heron Bay, Ontario; yellow birch and hard maple at Manitoulin and Haliburton, Ontario; spruce-balsam-birch at four locations in Quebec, including Lake Edward and Lake Kenogami; spruce-fir at Green River, New Brunswick; old-field white spruce in Nova Scotia; and spruce-balsam in Newfoundland. Several districts also made studies of seedbed improvement techniques using scarification and herbicides.

Growth and Yield—15%

Sample plot establishment for yield studies which will result in empirical or normal yield tables for the more important forest conditions in Ontario and Quebec, with special attention given to how these studies will tie in with methods of assessing site productivity.

Reforestation and Tree Breeding—15%

Experimental plantings and direct seedings in Newfoundland, the Maritime Provinces, and Manitoba, together with all Forest Experiment Stations. Tree breeding program at the Petawawa and Acadia Forest Experiment Stations with particular emphasis on the establishment of provenance tests with white spruce, red spruce, jack pine, and balsam fir; co-operation in tree breeding with industry; much progress made in grafting techniques with conifers.

Forest Management—5%

Study of provincial and federal legislation influencing forest management practice; limited technical assistance to industry in the development of management plans; operation of demonstration woodlots on experimental areas.

Mensuration—5%

Checking continued on promising mathematic functions developed to express tree volumes and for growth relationships. Studies in some districts to check the applicability of various mensurational techniques in measuring and forecasting forest growth and development.

Forest Inventories Section

Preparation of Stand Volume Tables—

Volumetric data for use by the air photo interpreter in making estimates of timber quantities collected in the field in accordance with four determinants: canopy density, average height weighted by volume, cover type, and site type. Stand volume tables based on these values, and subdivided in accordance with the ratio of canopy density to basal area per acre. Two hundred sample plots were measured in Algonquin Park and individual tree crowns were mapped.

Determination of Most Suitable Methods of Air Photography—

Research in the use of various cameras and films to increase the accuracy of fine tree measurements in air photographs and to facilitate the identification of tree species. Photographic operations were conducted

by the Royal Canadian Air Force at the request of the Forestry Branch to develop means for prevention of the blurring caused by the travel of the aircraft during the instant of exposure, the prevention of which is so important in photographs of large scale.

Development of Instruments

Advances in the technique of using air photographs for forest inventory purposes accompanied by demands for new or improved instruments. An article describing air photo overlays developed by the Section was prepared for distribution as a Technical Note.

Investigation of Forest Survey Techniques

Comparisons of field sampling procedures and of the forest inventory value of information obtainable from air photographs of various scales. A forest inventory method developed by the Section is based on a classification or stratification of the forest stands by photo interpretation followed by appropriate field sampling. This method has proved satisfactory over a period of five years.

A comparison of various inventory sampling methods was made in a company's timber limits. No practical differences were found between the mean values secured from sample plots located by the random method and those by the "selected line method", which is based on lines drawn between prominent map features in such a way as to cross the stand or stands to be sampled, but in which personal judgment is not employed for the selection of plot locations.

Fulfilment of Departmental Survey Requirements—

Forest inventories for areas in the Yukon and Northwest Territories, national parks, Indian reserves, and other federally administered lands, or for provincial lands where required.

Fire Protection Section

Forest Fire Danger Tables—

Field studies at specially selected forest fire research stations in Saskatchewan and Alberta to obtain basic data for use in preparing fire danger tables for the specific areas concerned. Related projects at the Petawawa and Kananaskis Forest Experiment Stations. Simplified forest fire danger tables for Newfoundland, New Brunswick, Quebec, Ontario, and Manitoba prepared for publication.

Weather in Relation to Fire Danger and Fire Behaviour—

Some relationships determined between the occurrence of low night-time humidity and upper winds in the eastern Rockies. Effect of topography on humidity, temperature, and wind variations studied at the Petawawa Forest Experiment Station. Dew deposition investigations continued at three field stations.

Fire Season Severity—

Preliminary analyses completed of 3,000 individual forest fires in New Brunswick to test hypotheses, developed in Section, for arriving at a mathematical solution to some phases of the problem.

Increasing the Effectiveness of Forest Fire Control—

Analysis and publication of field data observed in Manitoba relating to the effect of slash disposal methods on subsequent fire hazard completed; studies of the effectiveness and inflammability of various herbicides; investigation of the performance characteristics of various back-pack tanks and hand pumps; effect of field use on the leaching of forestry hose mildew-proofers; testing and modification of a device to aid in the locating of lookout towers; script and technical assistance for production of forest fire suppression training film.

5. Forest-Fire Losses in Canada, 1954
(Compared with 10-year Average, 1944–53)
(Exclusive of Yukon and Northwest Territories)

Item	Annual Average 1944-53	1954
Total number of fires.....	5,434	3,022
Total area burned (acres).....	1,587,561	265,626
Size of average fire (acres).....	292	88
Saw timber burned (M.ft.b.m.).....	451,243	46,474
Small material (cords).....	1,185,702	834,055
Actual cost of fire fighting.....	2,133,986	931,231
Other fire protection costs (1953).....	-	15,205,966
Area under protection (sq. mi.).....	-	1,106,694

6. Progress in Forest Inventories

Project Class	Estimated Area to be Covered	Approximate Area Covered			
		Prior to Fed.-Prov. Agreements	Under Fed.-Prov. Agreements		
			Prior to 1955-56	Fiscal Year 1955-56	Total to Date
	sq.mi.	sq.mi.	sq.mi.	sq. mi.	sq.mi.
Ground control surveys....	422,000	107,000	284,000	12,000	403,000
Air photography—					
Small scale.....	742,000	246,000	399,000	31,000	676,000
Medium scale.....	491,000	215,000	210,000	51,000	476,000
Total.....	1,233,000	461,000	609,000	82,000	1,152,000
Base Maps—					
Small scale.....	682,000	74,000	506,000	26,000	606,000
Large scale.....	381,000	215,000	101,000	27,000	343,000
Total.....	1,063,000	289,000	607,000	53,000	949,000
Field surveys for forest data.....	977,000	157,000	493,000	115,000	765,000
Interpretation of photo- graphs.....	1,122,000	162,000	573,000	172,000	907,000
Forest maps.....	1,063,000	84,000	421,000	127,000	632,000
Inventory reports.....	1,063,000	53,000	512,000	115,000	680,000

7. Reforestation under the Forestry Agreements

Province	Number of Trees Planted		Area Planted		Area Seeded	
	Fiscal Year 1955-56	Total to Date	Fiscal Year 1955-56	Total to Date	Fiscal Year 1955-56	Total to Date
			acres	acres	acres	acres
Prince Edward Island...	62,000	140,000	62	130	—	—
Nova Scotia.....	120,000	278,000	120	268	—	—
Ontario.....	10,935,000	43,960,000	10,935	43,960	—	6,000
Manitoba.....	—	1,992,000	—	1,728	—	—
Saskatchewan.....	269,000	964,000	196	738	230	751
British Columbia.....	—	11,949,000	—	14,160	—	—
TOTAL.....	11,386,000	59,283,000	11,313	60,984	230	6,751

8. Federal Payments to Provincial Governments Under the Forestry Agreements

Province	Forest Inventory		Reforestation		Total Federal Payments	
	Fiscal Year 1955-56	Total to Date	Fiscal Year 1955-56	Total to Date	Fiscal Year 1955-56	Total to Date
	\$	\$	\$	\$	\$	\$
Prince Edward Island..	—	—	15,000	54,030	15,000	54,030
Nova Scotia.....	121,616	234,261	1,200	3,132	122,816	237,393
New Brunswick.....	33,108	97,422	—	—	33,108	97,422
Ontario.....	254,828	1,312,685	109,354	445,602	364,182	1,758,287
Manitoba.....	50,032	288,546	2,878	30,094	52,910	318,640
Saskatchewan.....	40,832	203,488	2,691	8,884	43,523	212,372
Alberta.....	29,222	460,093	—	—	29,222	460,093
British Columbia.....	412,439	1,975,630	—	137,181	412,439	2,112,811
TOTAL.....	942,077	4,572,125	131,123	678,923	1,073,200	5,251,048

9. Budworm Spraying—New Brunswick

Distribution of Costs by Projects

(Federal Payments shown in Brackets)

Project	1953-54 (\$1,000,000)	1954-55 (\$314,271)	1955-56 (\$300,000) ¹	Total to Date (\$1,614,271)
	%	%	%	%
Airfield Construction and Maintenance..	25	6	7	19
Operational Buildings.....	4	4	3	4
Aircraft Loading Facilities.....	6	3	3	5
Aircraft Operation.....	22	38	35	28
Insecticide and Assessment of Spraying.	35	32	37	34
Administration and Other Expenditures.	8	17	15	10
TOTAL.....	100	100	100	100

¹ An additional sum of \$83,984 was paid out of the 1956-57 appropriation.

10. Timber, Hay and Grazing Permits, Camp Gagetown, N.B.

Permits	Number Issued
For timber.....	58
For hay.....	26
For grazing.....	4
Total.....	88

Dues Received	Amount
From sale of timber.....	\$ 15,901
From hay and grazing permits.....	170
Sub-total.....	\$ 16,071
During 1955-56 from adjustment of 1954-55 permits.....	\$ 1,157
Total.....	\$17,228

Product Sold	Quantity
Christmas trees.....	5,257 bundles
Sawlogs.....	648,332 ft. b.m.
Poles.....	2,212 pieces
Pulpwood.....	13 cords
Fuelwood.....	421 cords
Hay.....	492 tons
Grazing.....	27 head

11. Forest Products Laboratories

Research work, under main headings, is shown hereunder for the Ottawa and the Vancouver Laboratories. It is to be noted that work at Vancouver is mainly concerned with British Columbia and Alberta timbers and forest-based industries.

Timber Engineering

Ottawa

As testing progresses, revision of basic data continues on the mechanical and physical properties of Canadian timbers. Determination of strength variation within different species; of the effect of method of test on strength of poles; of strength of nailed trusses and wall panels constructed from wood products; and of the effect of long-time loading. Study of the fundamentals of laminated beam and arch construction, and the efficiency of glued, scarfed end joints in laminations.

Vancouver

Mechanical and physical properties of green and air-dry western white spruce determined from tests of small samples. Analyses made of the variability of coast and interior Douglas fir and of second-growth and old-growth material. Spiral grain and its effect on various use applications studied. Proposed changes in working stresses for structural timber reviewed, and causes of failure in structural members analysed. Analysis completed of strength of mountain-type Douglas fir telephone poles.

Veneers, Plywood, and Adhesives*Ottawa*

Investigations to determine the veneer cutting and plywood manufacturing properties of elm, white spruce, and other little-used species, the cutting properties of hardwoods and the temperature, knife angle, and other factors that affect the quality of rotary-cut veneers. Studies to determine the weathering properties of plywood adhesives. Investigations on the dielectric properties of wood glues. Studies on test procedures and specifications for wood adhesives. Durability of glue bonds in exterior flush doors. Causes of warping in furniture panels.

Vancouver

Testing of plywood dried at high temperatures. Gluability of hardboard measured by cleavage type test. Effect of phenolic resins on the strength of hardboard assessed. Factors affecting plywood lay-up patterns reviewed and analysed. Testing of plywood samples for determination of bond strength as indicated by wood failure or mechanical test.

Containers*Ottawa*

Studies of packing and packaging methods for National Defence and Agriculture. Continuing investigations on the design and strength of containers manufactured from wood products. Determination of nature and intensity of hazards during handling and transportation of packaged merchandise. Effect of different sheathing materials on the strength properties of enclosed containers.

Wood Preservation*Ottawa*

Studies to determine the suitability as a penta solvent of a residual petroleum oil for preservative treatment. Treatment of green fence-posts (jack pine, spruce, white birch, and poplar) by the diffusion process with various preservatives and placing in service for durability tests. Study of effect of preservative treatment on "bleeding" of poles. Continuation of work to establish a "laboratory reference preservative" for use in providing an efficiency rating for various preservatives in use or suggested for use. Continuance of the recording of durability data on test and service installations of posts, poles, and railway ties treated by different methods and with various preservatives. Studies on the modification of the penetration of preservatives into wood by the use of swelling agents. Durability of sash units given dip or brush treatments with preservatives. Treatment of mine timber by vacuum, open-tank, and pressure processes.

Vancouver

Analysis of factors affecting the drying rate of round western hemlock. Formulation of empirical equation indicative of probable behaviour of logs subjected to varying conditions of treatment in an experimental retort. Studies of the degree of impregnation of mountain-type Douglas fir by creosote applied by steaming and vacuum. Examination of durability of butt-treated lodgepole pine poles in service.

Pathology*Ottawa*

Investigations to determine the effect of fungi on the mechanical properties of wood. Isolation and identification of fungi causing decay in exposed wood and in indoor structures. Studies to determine the effect of moulds in retarding development of decay in birch logs and the nature and effect of brown discoloration in hardwood veneer logs. Continuation of assembly of a reference collection of fungi and preparation of descriptive material.

Vancouver

Identification of fungi causing red stain in lodgepole pine. Studies of the decay resistance of sound wood and incipiently decayed wood of western red cedar. Photomicrographs made of mycelial structures found in cultures of wood-inhabiting fungi. Information assembled on the causes and significance of the defects which occur in western Canadian softwoods. Identification of organisms isolated from logging residue.

Paint Coatings*Ottawa*

Studies to determine the durability of paints and other protective coatings under various climatic conditions, when applied to plywood and hardboards. Investigations to determine, under accelerated laboratory conditions, the effect of wood species on the durability of exterior coatings. Studies on the paintability of yellow cedar, particularly in respect of seasoning, surface preparation, and primers, and of the paintability of creosoted wood, the durability of floor and exterior finishes, the causes of blistering of paints on various wood species, and the behaviour of paint coatings on treated millwork. Studies on the evaluation of fire-retardant coatings.

Wood Chemistry*Ottawa*

Research into the manufacture of various types of structural boards from mill residues from various Canadian species. Experimentation on the development of bark pulp with satisfactory drainage qualities. Studies to modify the properties of wood by esterification, covering both sawdust and veneers. Research into delignification of sawdust, using chlorine dioxide and other oxidizing agents for the production of pulps. Studies on effect of adhesives and species of wood in plywood in causing corrosion in contact with metals.

Vancouver

Analytical methods formulated for determination of thujaplicins in solutions and in the wood of western red cedar. Exploratory column chromatography undertaken of the aqueous extractive of western red cedar. Work continued on the separation, isolation, and characterization of the phenols in western red cedar. Spotted brown stains occasionally occurring on cedar found to be chiefly caused by plicatic acid. Analysis of Douglas fir samples to determine the distribution of taxifolin from the pith to the periphery and from the butt to the top of a tree.

Microbiology*Ottawa*

Research into the decomposition of ligno-cellulose material—with a view to breaking down wood waste to a usable form—by means of anaerobic mesophilic bacteria.

Milling*Ottawa*

Research into the fundamentals of sawing wood to provide a basis for developing improved sawmilling equipment and practices. Construction continued of a mill of new design, using a travelling saw and stationary carriage. Studies on reduction of sawmill waste at its source and utilization of waste produced. Information obtained on use of wood waste for pulp manufacture, in electro-smelting, and in agriculture.

Vancouver

Studies of the effect of mechanical debarking on lumber grade recovery, overrun and sawing time. Compilation of data on the effect of seasoning and planing on lumber recovery, and analyses of losses in value in kiln-dried and air-dried lumber. Studies and compilations of solid residue and sawdust percentages at mills in the East Kootenay region of British Columbia.

Logging*Ottawa*

Study of methods which could result in lessening harvesting losses and increasing recovery from logged areas. Studies on effects of tree species and size on harvesting and lumber manufacture as a means of increasing utilization and obtaining closer integration. Applicability of log grading rules for eastern Canadian species.

Vancouver

Time studies of felling and bucking, skidding and decking, and loading in the southern interior of British Columbia, and compilation of data for Douglas fir, hemlock, spruce, larch, yellow pine, white pine, balsam, and cedar. Additional data obtained in respect to the extent and causes of breakage of trees during felling. Report prepared of logging waste study undertaken on a co-operative basis with the Alberta Forest Service.

Seasoning

Ottawa

Work completed on studies designed to determine the drying rate of green lumber when used in house construction, the moisture content of various building components, such as sash and doors, during various seasons of the year, and the dimensional change in glued panels for use as sheathing and roof construction. Study of an accelerated schedule for drying 1-inch yellow birch in conventional kilns. Continuation of investigations on drying both hardwoods and softwoods in a high-temperature kiln. Kiln course held for representatives from industry on improved seasoning techniques.

Vancouver

Studies of the differences in rates of moisture absorption between kiln-dried and air-dried lumber and lumber dried at high temperatures. Survey of the causes of breakage of stickers used in kiln-drying. Studies of the effect of drying and machining on degrade from loose and checked knots. High temperature kiln-drying research on Douglas fir and western hemlock.

Wood Structure

Ottawa

Studies for determination of the specific qualities which render individual species particularly suited to special uses. Investigations continued into a method of determining the fibre saturation point of wood by centrifugal force. Studies of the anatomical structural differences in compression and tension wood in relation to mechanical properties. Studies of the effect of structural characteristics on the dimensional changes in wood. Investigation of methods of selecting sample trees for appraisal of wood quality.

Vancouver

Identification of Canadian and foreign woods and sawdust samples. Microscopic examination of fractured glue lines, and of peculiarities in wood structure.

Talks by F.P.L. Staff

Talks were given on "Research and the Lumber Industry" by J. H. Jenkins, before the Annual Meeting of the Maritime Lumber Bureau, Saint John; on "Logging Waste" by J. A. Doyle, to the Northern Ontario Section, Canadian Institute of Foresters, Swastika; on "Waste Utilizations" by C. F. McBride, at the Annual Meeting, Northern Interior Lumbermen's Association, Prince George; on "An Analytical Method for Taxifolin and its Occurrence in Douglas Fir" by G. M. Barton, Spring Conference, Chemical Section, B.C. Academy of Sciences; by J. A. Doyle on the logging and milling research studies of the F.P.L. in the Maritimes, before Annual Meeting, N.S. Forest Products Association, at Shubenacadie, Regional Meeting—Maritime Lumber Bureau, at Weymouth, and Senior Forestry Students, University of New Brunswick; by D. E. Kennedy on timber engineering, before Engineering students, Carleton College, Ottawa; (in French) by J. A. Schryburt, on the utilization of logging and sawmill waste, and on F.P.L. sawmilling studies, before the Western Quebec Forestry Association, in LaSarre; by J. A. F. Gardner, on vanillin, before Vancouver Branch, Chemical Institute of Canada; by G. R. W. Nixon, on logging studies, before Vancouver Branch, Canadian Institute of Forestry.

APPENDIX E

1. Special Activities of Director

During 1955 the Director took part in deliberations of the newly formed Atlantic Provinces Economic Council at a meeting held at Halifax in May, and at the Seminar held at Fredericton in September. He attended the annual convention of the National Association of Travel Organizations in Chicago and while there accepted the Midwest Travel Writers' Award voted to the Canadian Government Travel Bureau for the best story and photo coverage outside the United States in 1955. In Washington he addressed a newly-installed Permanent Executive Council of the Inter-American Travel Congress.

Among the 25 speeches made by the Director in Canada and the United States during the year were addresses before the Kentucky Chamber of Commerce at Somerset, Kentucky; the Pacific Northwest Trade Association at Vancouver; the New England Hotel Association at Hartford, and the Canadian Hotel Association Convention at Halifax. In addition he addressed several tourist groups and service clubs during Tourist Service Week.

APPENDIX F

LIST OF PUBLICATIONS ISSUED 1955-56

National Parks Branch

Canadian Wildlife Service

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- Series 1, Number 11: *Wolf Control Operations, Wood Buffalo National Park, 1951-52.* W. A. Fuller and N. S. Novakowski.
- Series 2, Number 8: *Birds of Jasper National Park, Alberta.* Ian McTaggart Cowan.
- Series 3, Number 4: *Investigation of the Spawning of Northern Pike in Prince Albert National Park, Saskatchewan.* F. H. Schultz.

Technical Articles

- Food and Feeding Habits of Brünnich's Murre (Uria lomvia lomvia) on Akpatok Island.* Leslie M. Tuck (collaboration). J. Fish Res. Bd. Canada 12(5): 781-792. 1955.
- A Provisional Life Table for the Barren Ground Caribou.* A. W. F. Banfield. Can. J. Zool., 33:143-147. 1955.
- A First Record of the Starling in the Northwest Territories.* W. A. Fuller. Can. Field-Nat. 69(1): 27. 1955.
- Three Observations of Predators Attacking Prey.* J. S. Tener. Can. Field-Nat. 68(4): 181-182. 1954.
- The Inconnu (Stenodus leucichthys mackenziei) in Great Slave Lake.* W. A. Fuller. J. Fish Res. Bd. Canada 12(5): 768-780. 1955.
- Further Notes on the Birds of Banff National Park, Alberta.* A. W. F. Banfield. Can. Field-Nat. 68(4): 182. 1954.
- The Longevity and Fertility of the Orkney Vole (Microtus orcadensis) as Observed in the Laboratory.* J. S. Tener (collaboration). Proc. Zool. Soc. London 125(1): 115-125. 1955.
- The Caribou Crisis.* A. W. F. Banfield. The Beaver, Outfit 286, Spring 1956, pp. 3-7.
- Feeding Habits of Juvenile Ring-necked Pheasants on Pelee Island, Ontario.* A. G. Loughrey (collaboration). Can. Field-Nat. 69(2): 59-65. 1955.
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- Modifications in Mass Goose Trapping Technique.* Graham Cooch. J. Wildlife Mgmt., 19(2): 315-316. 1955.
- The Game that Never Was.* V. E. F. Solman. C.I.L. Oval, October, 1955.
- Observations of the Autumn Migrations of Blue Geese.* Graham Cooch. Wilson Bull. 67(3): 171-174. 1955.
- Effects of Hail Storms on Waterfowl Populations in Alberta, Canada.* Harry R. Webster (collaboration). J. Wildlife Mgmt. 19(3): 368-374. 1955.

Spring Record of Ross Goose from James Bay, Ontario. Graham Cooch. Condor 57(3): 191. 1955.

Saving the Species. J. Clifton Ward. C.I.L. Oval, February, 1956.

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Canada's Place in Flyway Management. David A. Munro and J. Bernard Gollop. Pp. 118-125.

An Aerial Survey Technique for Northern Big Game. A. W. F. Banfield, D. R. Flook, J. P. Kelsall, and A. G. Loughrey. Pp. 519-532.

Barren-Ground Caribou Movements in the Canadian Arctic. J. P. Kelsall. Pp. 551-560.

Miscellaneous

Don't Shoot Swans, Ross's Geese, Whooping Cranes. Revised folder.

Investigations of Woodcock, Snipe, and Rails in 1955. Special Scientific Report: Wildlife No. 31. Published jointly with the U.S. Fish and Wildlife Service.

National Museum

Bulletins

Bulletin No. 65 (Third Edition). *The Indians of Canada.* Diamond Jenness. Anthropological Series No. 15, 452 pages, 1 map, 7 coloured plates and 120 other illustrations.

Bulletin No. 135. *The Vascular Plants of the Western Canadian Arctic Archipelago.* A. E. Porsild. 226 pages.

Bulletin No. 136. *Annual Report of the National Museum of Canada, for the Fiscal Year 1953-54.* 122 pages, 13 plates, 22 figures.

Bulletin No. 137. *Ecological Control of the Occurrence of Barnacles in the Miramichi Estuary.* E. L. Bousfield. 69 pages, 11 figures.

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- The Second Sheguiandah Expedition, Manitoulin Island, Ontario.* Thomas E. Lee. American Antiquity, Vol. 21, No. 1, July. Pp. 63-71. Five plates.
- The North American Races of Saxifraga flagellaris Willd.* A. E. Porsild. Bot. Tidsskr. Copenhagen, Vol. 51, pp. 292-299.
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- The Cattle Egret off Newfoundland.* W. Earl Godfrey. Can. Field-Nat., Vol. 68, No. 3, 1955.
- Beaks and Feet of Birds.* W. Earl Godfrey. Canadian Nature, Vol. 17, No. 4, 1955.
- Additional Notes on Birds of the East Kootenay, British Columbia.* W. Earl Godfrey. Nat. Mus. Canada, Bull. 136, 1956.
- Four reviews of literature: W. Earl Godfrey. Can. Field-Nat., Vol. 69, Nos. 1, 2, 1955.
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Bulletin 117. The Influence of Seed-Bed Conditions on the Regeneration of Spruce and Balsam Fir. I.C.M. Place. Price \$2.00.

Bulletin 118. Forest Site Classification of the Northeastern Coniferous Section, Boreal Forest Region, Quebec. A. Linteau. Price \$2.00.

Technical Notes

No. 6. *Development of a Balsam Fir and White Spruce Forest in Northwestern New Brunswick.* A. B. Vincent.

No. 7. *A Summary of the Management Plan for the Green River Area, New Brunswick.* D. E. Nickerson and A. B. Vincent.

No. 8. *A Forest Survey Method.* H. E. Seely.

No. 9. *Standard Volume Tables for Lodgepole Pine in Alberta.* A. W. Blyth.

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No. 11. *Yield of White Spruce and Balsam Fir in an Undisturbed Stand.* R. T. Pike.

No. 12. *Slip-on Tankers for Forest Fire Protection.* J. S. MacTavish.

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No. 15. *Effect of Watering, Shading, Seed-Bed Medium and Depth of Sowing on Red Pine Germination.* J. W. Fraser and J. L. Farrar.

No. 16. *Early Developments in a Subalpine Lodgepole Pine Stand of Fire Origin.* K. W. Horton.

No. 17. *Average Height Weighted by Volume in Air Photo Interpretation.* F. D. MacAndrews.

No. 18. *Yield of Even-Aged Fully Stocked Spruce-Poplar Stands in Northern Alberta.* W. K. MacLeod and A. W. Blyth.

No. 19. *Lodgepole Pine Stands at the Strachan Experimental Block in Alberta.* D. I. Crossley.

- No. 20. *Northern Clay Belt Growth and Yield Survey.* D. W. MacLean and G. H. D. Bedell.
- No. 21. *The Petawawa Plantations.* W. M. Stiell.
- No. 22. *Fire Hazard Resulting from Jack Pine Slash.* D. E. Williams.
- No. 23. *The Effect of Various Slash Disposal Methods on the Regeneration of Cut-Over Jack Pine Stands.* H. J. Johnson.
- No. 24. *Mechanical Scarification to Induce White Spruce Regeneration in Old Cut-Over Spruce Stands.* D. I. Crossley.
- No. 25. *The Production and Dispersal of Lodgepole Pine Seed.* D. I. Crossley.
- No. 26. *Forestry Problems of Bonavista Peninsula, Newfoundland.* W. C. Wilton and H. S. Lewis.
- No. 27. *Site Types, Growth and Yield, Lake Edward, Laviolette County, Quebec.* R. G. Ray.
- No. 28. *Planting of Conifers in the Spruce Woods Forest Reserve, Manitoba.* J. S. Jameson.
- No. 29. *Scion Storage and Graft Protection in the Spring Grafting of Red Pine.* M. J. Holst.
- No. 30. *Assessment of Site Productivity in Dense Lodgepole Pine Stands.* L. A. Smithers.
- No. 31. *Plantations of the Acadia Forest Experiment Station.* J. W. McLeod.
- No. 32. *The Possibility of Continuous Planting of White Spruce Throughout the Frost-Free Period.* D. I. Crossley.
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Breakage and Other Losses in Logging on the Pacific Coast. G. R. W. Nixon.

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- Structure of Wood.* J. D. Hale. Reprinted from *Timber of Canada*, April, 1955.
- High-Temperature Drying of Lumber.* J. L. Ladell. Reprinted from *Timber of Canada*, July, 1955.
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APPENDIX G

Annual Report of the Commissioner of the

Northwest Territories—1955-56

Commissioner—GORDON ROBERTSON

Council

The Council met twice, the first session taking place at Fort Smith from August 29th to September 8th, and the second at Ottawa, from January 16th to 23rd.

An outstanding event in the history of the Council was the presentation by the Governor General of Canada, during the second session, of a Mace which had been made, on the direction of His Excellency, by Eskimo craftsmen at Cape Dorset. The artistic qualities of the Mace have already attracted widespread attention, both in Canada and abroad.

At both sessions the members took the opportunity during the debate on the Commissioner's Address to give their views on matters of importance to their constituents and the Territories as a whole. Subjects such as the economic future of the Territories, transportation, education, social services, the integration of the native population, defence activities, wild-life resources and the fur industry, and financial relationships with the Federal Government were reviewed. On behalf of Council, the Commissioner presented a brief on the development of the Northwest Territories to the Royal Commission on Canada's Economic Prospects. During the year a Coat of Arms for the Territories was approved by Her Majesty the Queen following a recommendation by the Council. Thirty-one bills were passed at the first session and five at the second session, most of these being amendments to existing legislation. The most important piece of legislation was an overall revision and consolidation of all Northwest Territories Ordinances to date.

Arising out of the discussions, during the January meeting, on the decline in the income derived from fur, the Council resolved that the Federal Government be asked to give immediate consideration to the provision of assistance to the people of the Northwest Territories through the establishment of an appropriate measure of support for the price of fur; or alternatively to take all possible measures at the earliest date to stimulate the economic development of the Northwest Territories so that alternative means of employment and income can be provided. Pursuant to this resolution, an interdepartmental committee of the Federal Government has been directed to study the terms of the resolution, together with the related economic problems of the nomadic Indians in the northern part of the Provinces, and consider what action might be taken to stimulate economic development in the north.

Economic Activity

In general, economic activities in the Northwest Territories showed some slight improvement compared with the previous year. Serious underlying problems, however, still remain.

The employment opportunities for local labour, created by the construction of the Distant Early Warning line, the move of Alklavik, and other government construction programs have provided some much needed

additional income for a number of those who were formerly dependent upon fur trapping for a livelihood. These and similar opportunities will occur for several years, but only a relatively small proportion can be counted upon to continue for longer than that. They therefore cannot be regarded as a cure for the problem of economic distress in these communities but merely as a short-term palliative. Full use must be made of the respite thus provided to develop more permanent sources of employment for a substantial number of those now engaged in trapping.

The weakness of the mining industry in the Territories is its concentration on gold and uranium, both of which are at present under somewhat of a shadow. Gold mining is suffering from the squeeze that occurs between a fixed price and rising costs during times of prosperity, and the outlook for uranium is perplexed by doubt as to the future demand, and hence an uncertainty as to what the price will be when the government contracts terminate in 1962. If some of the intensive exploration which is now being undertaken for base metals in the Territories should result in the development of several mines, it would give a more healthy foundation to the industry. With base metal as well as gold mines in production, the economy would have some insulation against the rigours of inflation as well as those of deflation. The greatest single problem in making base-metal mining economic in the Territories is that of reducing the cost of transportation.

Preliminary figures indicate that the value of mineral production in 1955, including pitchblende, totalled \$23,451,000 compared with \$26,408,000 in 1954. Gold production for 1955 was \$10,990,000 compared with \$10,513,000 in 1954, while pitchblende production in 1955 had declined to \$12,000,000 compared with \$15,486,000 in 1954.

The claim staking late in 1955 and early in 1956 indicates that there will be considerable exploration activity. Over 2,000 mineral claims were staked on the north shore of Great Slave Lake in the vicinity of Sulphur Bay for occurrences of lead and zinc, and another substantial block was staked close to the holdings of Pine Point Mines Limited. Owing to the increased price of copper and the known presence of good grade copper in the Northwest Territories, exploration activities were widespread. Mining activity for uranium was confined to those properties where the stage of underground development has been reached, interest having waned because of the announcement that no special contracts would be awarded after the 31st of March, 1956. Activity in exploration for oil and gas continued in the Kakisa Lake Area where seven new wells were drilled, one of them being suspended as a gas well and the remaining six being abandoned as dry holes. Twenty-six test holes also were drilled, and six helicopters in addition to geological personnel were active in this area. There were 167 active Oil and Gas Permits with a total of 8,876,000 acres under permit.

The production of whitefish and lake trout in the Great Slave Lake fishery for 1955-56 amounted to 7,100,000 pounds. This showed a satisfactory increase over the 6,700,000 pounds caught in 1954-55, but it is still well below the annual quota of 9,000,000 pounds. The marketed value of the 1955-56 catch, f.o.b. plant at Hay River, was \$1,400,000, but no comparison can be made with the previous year because of a change in the basis of statistical calculation.

The fur-trapping industry in the Territories, after a drastic decline in 1953-54, showed some improvement in the crop year 1954-55. The number of pelts taken during 1954-55 was 478,000, valued at \$1,167,000,

which compares with 419,000 for 1953-54 with a value of \$757,000. This recovery, however, was from a very low level, and the fur trade continues in a depressed condition with no indication of substantial revival. To the problems created by the vagaries of fashion have been added the new threat of competition from low-priced synthetic furs, an industry which is advancing with rapid technological strides.

Workmen's Compensation

The revised workmen's compensation plan which came into force on January 1, 1953, continued to operate successfully. The number of insured employers was 209, an increase from the previous year's total of 183.

Increased activity in the north, including construction of the Distant Early Warning line, resulted in a 34 per cent increase in the number of accidents reported over the previous year and an increase in compensation payments and medical costs.

The figures for the last two years are as follows:

	1954	1955
Non-compensable accidents	442	432
Compensable accidents	245	485
Compensation payments	\$45,116	\$89,827
Medical and hospital payments	\$35,277	\$54,427

During the year the Workmen's Compensation Ordinance was amended to provide for compensation benefits based on maximum yearly earnings of \$4,000 rather than \$3,000, and widows pensions were increased from \$50 to \$75 a month.

Health

The most significant development in the health field in 1955 was the establishment by the Federal Government of Northern Health Services. Northern Health Services acts as a co-ordinating agency with respect to all health services in the Territories. During the year the territorial government participated to the extent of providing part of the cost for additional professional personnel in the Territories. These included a second doctor at Fort Smith, a dentist to service all points south of Fort Simpson, an eye specialist stationed in Edmonton to service the Mackenzie District, and a public health nurse to be stationed at Fort Smith. At the January session of the Council, approval was given in principle to the establishment of a free cancer treatment program to come into operation on April 1, 1956, for all residents of the Territories. Eleven hospitals were operated in the Northwest Territories during 1955.

Under the National Health Grants program, the eyesight survey in the Mackenzie District, which began the previous year, was continued, and 2,200 residents were examined in the spring of 1955. Further work was done in the winter of 1955-56. Cancer diagnosis, including transportation, was provided without charge, as were tuberculosis treatment, dental services for children in Yellowknife, Fort Smith, and Hay River, and treatment for crippled children. A chest X-ray survey was carried out in the summer months in conjunction with the Department of National Health and Welfare.

Welfare

Relief assistance was provided for indigents as required. At March 31, 1956, there were 93 recipients of Old Age Assistance, of whom 74 were Treaty Indians and 8 were Eskimos, and 18 recipients of Blind Persons Allowances.

The Disabled Persons Allowances Ordinance came into operation on January 1, 1956, with the signing of an agreement with the Federal Government for sharing costs. The program provides for allowances up to a maximum of \$40 per month for residents of the Territories who are permanently and totally disabled and who qualify under a means test. An important aspect of the overall program will be provision for rehabilitation of the seriously handicapped.

Preliminary discussions were entered into with the Department of Social Welfare of the Province of Alberta, whereby children deemed by the Courts to be in need of protection pursuant to the provisions of the Protection of Children Ordinance can be placed in institutions in Alberta under the direction and supervision of the Alberta Department of Social Welfare in cases where foster homes cannot be found in the Territories.

Education

The Department of Northern Affairs and National Resources operated Day Schools at Aklavik, Fort Smith, Hay River, Fort Resolution, Fort Simpson, Fort McPherson, Arctic Red River, Fort Franklin, Fort Good Hope, Fort Norman, Rae, Fort Liard, Rocher River, and Coppermine. The territorial government reimbursed the Department its proportion of the costs, based on the number of children, other than Indian and Eskimo, in attendance. A number of Welfare Teachers were on the staffs of these schools, who, in addition to their normal teaching duties, gave leadership to local activities designed to effect improvements in community welfare.

Yellowknife Public School District No. 1 operated a modern fifteen-classroom elementary and high school. On March 31, 1955, this school had an enrolment of 242 pupils, in Grades I to XII. The Yellowknife Roman Catholic School District No. 2 operated a four-classroom school, which on March 31, 1955, had an enrolment of 105 pupils, in Grades I to X. Grants were made to both school districts.

At Port Radium a school was operated jointly by the Eldorado Mining and Refining (1944) Ltd. and the Administration. At Discovery Yellowknife Mine, 60 miles from the Town of Yellowknife, a school was operated by the Mine management assisted by a grant from the Administration. A Day School was operated by the Roman Catholic Mission at Fort Smith, and Residential Schools were operated by the Anglican Church at Aklavik and by the Roman Catholic Church at Fort Resolution, Fort Providence, and Aklavik.

An annual scholarship of \$1,200 was provided by the territorial government, to be payable for four years to the student obtaining the highest mark in the Grade XII examinations, on the condition that continuation of such scholarship beyond the first year be subject to satisfactory

progress being made by the student. Two student residents of the Northwest Territories are at present attending the University of Alberta under this scholarship plan.

Early in 1955 it was announced by the Federal Government that it had approved an extensive program for the construction of schools and hostels to provide better education for children in the Northwest Territories, and that the construction phase of the program would be spread over six years, with the main emphasis on the Mackenzie Valley. Considerable headway was made in planning the schools and hostels for Fort McPherson, Fort Smith, Aklavik, and Yellowknife. Others will follow.

A special curriculum is in the process of preparation for Indian, Eskimo, and other children in the Territories. It will be designed to prepare children for the types of employment that are likely to be available in the Territories. For a number of schools, equipment and supplies were provided to assist in manual training instruction and physical fitness programs. Shipments of films were made on a monthly basis to settlements in the Mackenzie District, and school broadcast programs were featured over the Mackenzie District radio stations.

The beginning of the year 1955 saw the appointment of a Vocational Training Co-Ordinator to be stationed at Fort Smith, whose functions are to organize and supervise the newly inaugurated Vocational Training program to prepare students for gainful employment. This training program has developed over the past year, and approximately 107 persons have either completed their training, or are taking it. A great many have received this training outside the Territories, at such centres as Edmonton, Calgary, Winnipeg, and Montreal. There are a growing number of applicants desirous of receiving training through the medium of 'local training programs' at points selected within the Territories.

Game

In view of the alarming decline in the caribou population revealed by field surveys, expenditures on predator control programs, which were begun in 1952-53 and expanded in 1954-55, were greatly increased. Wolf poisoning programs were intensified along the migration routes of the caribou; two full-time wolf hunters were hired, and wolf traps were distributed amongst Eskimos trapping on the mainland.

Returns from licences issued for the year ended June 30, 1955, showed the number of pelts taken to have been 477,611, an increase of 58,744 over the previous year. Most of the increase was due to a larger take of white fox, which rose to 60,483 from the previous year's 27,178. A decided increase was also shown in the take of muskrat, beaver, and squirrel.

Municipal and Local Improvement Districts

Conditions in the Settlements of Fort Smith and Fort Simpson were considered to warrant participation by owners of property in the cost of local improvements, and these two Settlements were established as Local Improvement Districts in November, 1954. The initial assessment was carried out, and taxes will be levied for the first time in the year 1956-57, based on expenditures in 1955-56.

Finances

Territorial Revenues for the fiscal year totalled \$1,557,618.42. The principal revenues were as follows:

Liquor receipts	\$ 974,836.40
Payments under the Federal Tax Rental Agreement	284,019.60
Fuel Oil Tax	73,805.55
Fur Export Tax	66,624.99
Motor Vehicle and Drivers Licences	20,481.03
Business Licences	9,040.37
Payments from the Federal Government under various agreements	52,278.72

Territorial Expenditures for the fiscal year totalled \$1,368,053.31. The principal expenditures were as follows:

Education	\$ 302,613.61
Health	168,414.19
Welfare	77,830.53
Development Services	57,766.09
Grants to Municipalities and Purchase of Debenture	95,545.13
Operation of the Liquor System	593,902.47

At the end of the fiscal year, the territorial government owned buildings having a book value of \$157,215, held debentures from the Yellowknife Public School District worth \$55,500, held an outstanding loan owed by the Yellowknife Municipal District of \$6,000, held debentures from the Yellowknife Municipal District worth \$72,000, and had cash in the Northwest Territories Revenue Account totalling \$1,118,176.51. Of this last amount, \$167,680 was being held as a reserve for hospital construction, \$195,532 as a reserve for the construction of trunk roads, and \$58,702.72 as a reserve for workmen's compensation, leaving a cash surplus free from commitment amounting to \$696,261.79.

APPENDIX H

Annual Report of the Commissioner, Yukon Territory—1955-56

Commissioner—F. H. COLLINS

1. Council

The Council of Yukon Territory held three sessions during the fiscal year. The members of the Council elected in 1955 for a three-year term are as follows:

- V. C. Mellor, Dawson (Dawson District)
- D. C. McGeachy, Mayo (Mayo District)
- A. R. Hayes, Carmacks (Carmacks-Kluane District) Speaker
- J. L. Phelps, Whitehorse (Whitehorse East)
- R. Hulland, Whitehorse (Whitehorse West)

The appointed officers are W. D. Robertson, Clerk of the Council, and F. G. Smith, Legal Adviser. The 1955-56 Council Sessions took place at Whitehorse, from July 28 to July 29, 1955, November 2 to November 17, 1955; and from March 21 to April 11, 1956. Seven Ordinances were passed at the first session, twenty-six at the second session, and thirteen at the third session. Many of these were amendments to and revisions of existing Ordinances.

A brief on the development of Yukon Territory was presented to the Royal Commission on Canada's Economic Prospects by the Commissioner on behalf of the Council. A Coat of Arms for the Territory was approved by Her Majesty the Queen following a recommendation made by the Council.

2. Territorial Secretary's Department

Staff—Owing to the increase of social welfare problems in the Territory, an Assistant to the Territorial Secretary was appointed. A full-time Territorial Assessor and Tax Collector was engaged.

Vital Statistics—A total of 506 births, 108 marriages, and 77 deaths were recorded in the Territory.

Licences—Business licences, totalling 348, were issued. Motor vehicle and operator licences totalled 9,477. This figure included 2,285 passenger car, 35 taxi, 1,340 truck, 3,529 driver, and 1,778 chauffeur licences.

Company Registration—There were 7 incorporations and 23 extra-territorial companies licensed or registered. Of 191 companies in good standing, 79 were incorporated in the Territory. Revenue for the year totalled \$5,640.35.

Assessment—The total assessment figure for the Territory was \$2,360,027.44, an increase of \$60,586.52 over the previous year.

Boiler Inspections—The Boiler Inspector inspected 79 boilers and pressure vessels and interviewed 9 applicants for engineer's certificates. Forty-four engineer's certificates were renewed, and 9 new and 3 temporary certificates were issued.

Public Welfare Services

Mental Health Services—Under an agreement with the Province of British Columbia, residents of the Territory who are adjudged insane are admitted to the Provincial Mental Hospital at Essondale, B.C.

During the year, 11 persons were adjudged insane, and the total expenditure for mental health services was \$43,850.83.

Cancer Control—A cancer control program was established at the beginning of the fiscal year. Two cases received treatment in Provincial Hospitals. The cost to the Territory for this service was \$1,099.90.

Child Welfare—Fifty-two children were maintained in schools, hostels, foster homes, and other institutions locally and in the provinces at the expense of the Territorial Government. The total expenditure for this service amounted to \$25,883.74.

Social Assistance—Social assistance consisted of cash allowances, subsistence allowances, hospitalization, medical services, medicines, fuel, clothing, public utilities services, transportation, and burial services. The total expenditure incurred for these services amounted to \$74,371.95.

Pensions—Pensioners in the Age Group 65 to 69 increased from 13 to 20. The Blind Group increased from 3 to 6. The cost to the Territory for pensions was Age Group 65 to 69, \$7,253.39; Blind Group, \$1,795.

Workmen's Compensation—Of a total of 831 accidents reported, 3 were fatal and 8 involved permanent disability. Other compensable accidents numbered 226 with 594 non-compensable requiring only medical attention, with no time loss. Submissions to the Referee numbered 31.

Net administrative assessment revenue amounted to \$18,880.42. Compensation payments by insurers and employers totalled \$37,781.16, and medical payments \$36,469.69.

3. Department of Education

There were 16 schools in operation, with 65 full-time teachers and one part-time teacher employed. Enrolment on September 1, 1955, was 1,546, and on March 1, 1956, it was 1,501.

Period: September 1, 1954 – August 31, 1955

A ten-classroom wing was added to the Whitehorse Elementary-High School and a six-apartment teacherage was constructed adjacent to the original Whitehorse school.

Testing Program—A standardized testing program was prepared and included tests in scholastic aptitude, reading, writing, arithmetic, and spelling.

Governor General's Medal Competition—Fifty-five students from Whitehorse Elementary-High School, Christ the King School, and Dawson Elementary-High School wrote the examinations with Betty Jean McCormack of Dawson being declared the winner.

Period: September 1, 1955 – March 31, 1956

Major changes made in the program of studies at the Whitehorse Elementary-High School included the addition of a music department, commercial department, and the establishment of a central library.

The new Christ the King separate school at Whitehorse was officially opened in January. The building includes 8 classrooms and a commercial room, science laboratory, auditorium, and general offices. The new Keno School was officially opened at the end of February. This building contains a teacher's apartment.

During the week October 3-8, the first Yukon Teachers' Institute Convention was held. The purpose of the Institute is to promote a framework for in-service training and to generally familiarize teachers with the philosophy of education and the program of studies in the Territory.

4. Department of Health

Two nurses are located at Whitehorse—one a public health nurse, the other a welfare nurse. In spite of the inconvenience of travel, all the populated areas of the Yukon have been visited by the nurses at least four times in the last year.

Services—There has been an increase in the number of individuals served by this department. The number of infants, pre-school children, school children, and adults receiving individual attention from the nurses totalled 6,174, an increase of approximately 1,200 over the last year.

Two series of prenatal classes were held in 1955. These series, of five lectures each, dealt with the hygiene of pregnancy, breast feeding, nutrition, and care of the infant. Well-baby clinics are held weekly in Whitehorse. In the Mayo and Dawson areas a program for immunization of pre-school children was carried out by local medical health officers. The public health nurse held clinics and made home visits. In the smaller communities well-baby clinics are held in conjunction with school immunization whenever possible.

Plans are being formulated to have all new born babies visited in the home at least once after discharge from hospital.

Routine immunization was done by the public health nurse. Salk polio vaccine was administered in 1955 to all grade one pupils in Whitehorse, Dawson, Mayo, Elsa, and Watson Lake. In 1956-57 polio vaccine will be given to grades one to five in all schools in the Yukon.

In January and February of 1956, a mild outbreak of infectious hepatitis occurred in Whitehorse, and prophylactic treatment was given to some 400 persons. Early in 1956 a number of cases of epidemic type influenza occurred in the Dawson and Mayo areas.

Tuberculosis—The annual chest X-ray survey was carried out in July, and approximately 400 X-rays were taken. About 115 follow-up X-rays of tuberculosis patients, contacts, and suspects were taken.

Only 7 new cases of tuberculosis were admitted to sanatorium, 22 patients were discharged, and 2 died. At the year's end, there were 12 tuberculosis patients from the Yukon in sanatorium.

Hospitals—Preliminary work was done in connection with the hospital to be built on the east side of the Yukon River at Whitehorse, and discussions on the new hospital at Mayo were continued. The present

hospitals at Whitehorse and Mayo are operated by local boards under direction of the Territorial Government. The Whitehorse Hospital received a grant of \$25,722, and the Mayo Hospital a grant of \$7,712. St. Mary's Hospital at Dawson, operated by the Sisters of Ste. Anne, received a grant of \$18,316.

Sanitary Inspections—The sanitary inspector carried out the following inspections: restaurants, 237; meat, grocery and confectionery stores, 146; hotels and lodging houses, 195; public places, 96; as well as many inspections of other types. Fifty-five complaints were received, of which 40 were dealt with by the inspector, and 15 were referred to other departments. Twenty-two written notices were issued, and 88 verbal notices given.

Improvements in sanitation conditions have continued. Progress was made on the sewer and water project in Whitehorse.

5. Department of Game

Big Game—Moose and mountain goat appear to be holding their own, and white Dall sheep increased slightly. Grizzly, black, and brown bear, and caribou decreased slightly. Elk and bison introduced in the past few years are doing well.

Resident angling licences issued numbered 2,233, and non-resident, 1,566. There were 81 non-resident hunting licences issued as against 62 last year. Fur export tax revenue increased to \$9,356.60 from \$8,036.34.

Total revenue amounted to \$29,009.60 including \$11,400 from non-resident alien big game licences, \$3,690 from resident licences, and \$1,825 from 365 renewals of trap-line registrations.

Game Taken — Season 1954-55

	Bear	Grizzly	Caribou	Moose	Sheep	Goat	Coyote	Wolves	Wolverine
Non-resident Autumn hunters (1955).....	7	43	46	29	68	6	—	7	2
Resident hunters (1955).....	61	25	250	124	30	3	22	13	Eagles 4
Registered trappers..	41	18	1,167	185	11	3	36	39	—
TOTAL.....	109	86	1,463	338	109	12	58	59	4E 2W

One hundred and fifty lethal stations for wolf control were established late in March between the British Columbia border and the 65th parallel. Eight lethal permits were issued to game guardians.

General check-ups were made in co-operation with the R.C.M. Police on two occasions, supplemented by a number of routine and special game patrols. Road patrols totalled 7,698 miles, and water patrols 210 miles. Twelve prosecutions were instituted resulting in 11 convictions and one withdrawal.

Registered Trap-lines—There were 376 individual trap-line registrations recorded, compared with 370 last year. North of the 65th parallel there were 51 family registrations unchanged from last year.

Fur-Bearing Animals Taken by Registered Trappers

	Season 1953-54	Season 1954-55	Increase	Decrease
Beaver.....	1,842	2,843	1,001	—
Fisher.....	29	20	—	9
Otter.....	38	58	20	—
Fox, Black.....	1	—	—	1
“ Cross.....	29	26	—	3
“ Red.....	108	102	—	6
“ Silver.....	3	1	—	2
“ White.....	69	379	310	—
Lynx.....	482	1,140	657	—
Marten.....	648	850	203	—
Mink.....	481	427	—	54
Muskrat.....	40,689	42,565	1,876	—
Weasel.....	731	552	—	179
Squirrel.....	67,345	80,983	13,638	—

5. Department of Public Works**Roads and Bridges**

Whitehorse-Mayo Highway—An extensive program of maintenance and re-surfacing was carried out on the highway by United Keno Hill Mines Limited under contract with the government of the Yukon Territory, with financial assistance provided by the Federal Government. All ferries were overhauled, pontoons were installed on the ferry at the Stewart River, and bow plates were installed on ferries at Carmacks and at the Stewart.

Mayo-Elsa Road and Duncan Creek Road—Surface repairs, surface blading, and ditching were carried out over the full length of these two roads, and bridge repairs were made.

Dawson-Stewart Crossing Road—Widening grade, ditching, culvert overhauling, trimming slopes, realignment, and regravelling were done on large stretches of this road. From its junction with the road leading to North Fork, the Dawson-Stewart Crossing Road is being re-routed to the Ogilvie Bridge near Dawson.

Dawson-Boundary Road—A program of work was commenced with a view to widening, ditching, improving alignment, and gravelling throughout. Reconstruction was started at Boundary and carried on toward Dawson.

Atlin Road—In addition to the regular maintenance, a diversion approximately 4 miles in length was made in the vicinity of Mile 13. This diversion made it possible for loaded trucks to ascend this hill without trouble.

Other Roads and Bridges—Improvements were made, and regular maintenance carried out on the Dawson-Dome, Carmacks, Carcross, Tagish, Two Mile Hill, and Takhini Hot Springs roads and several minor roads. The Miles Canyon and Carcross bridges were repaired, and a new bridge was constructed over Hunker Creek on the Dawson-Stewart Crossing Road.

ARCTIC OCEAN

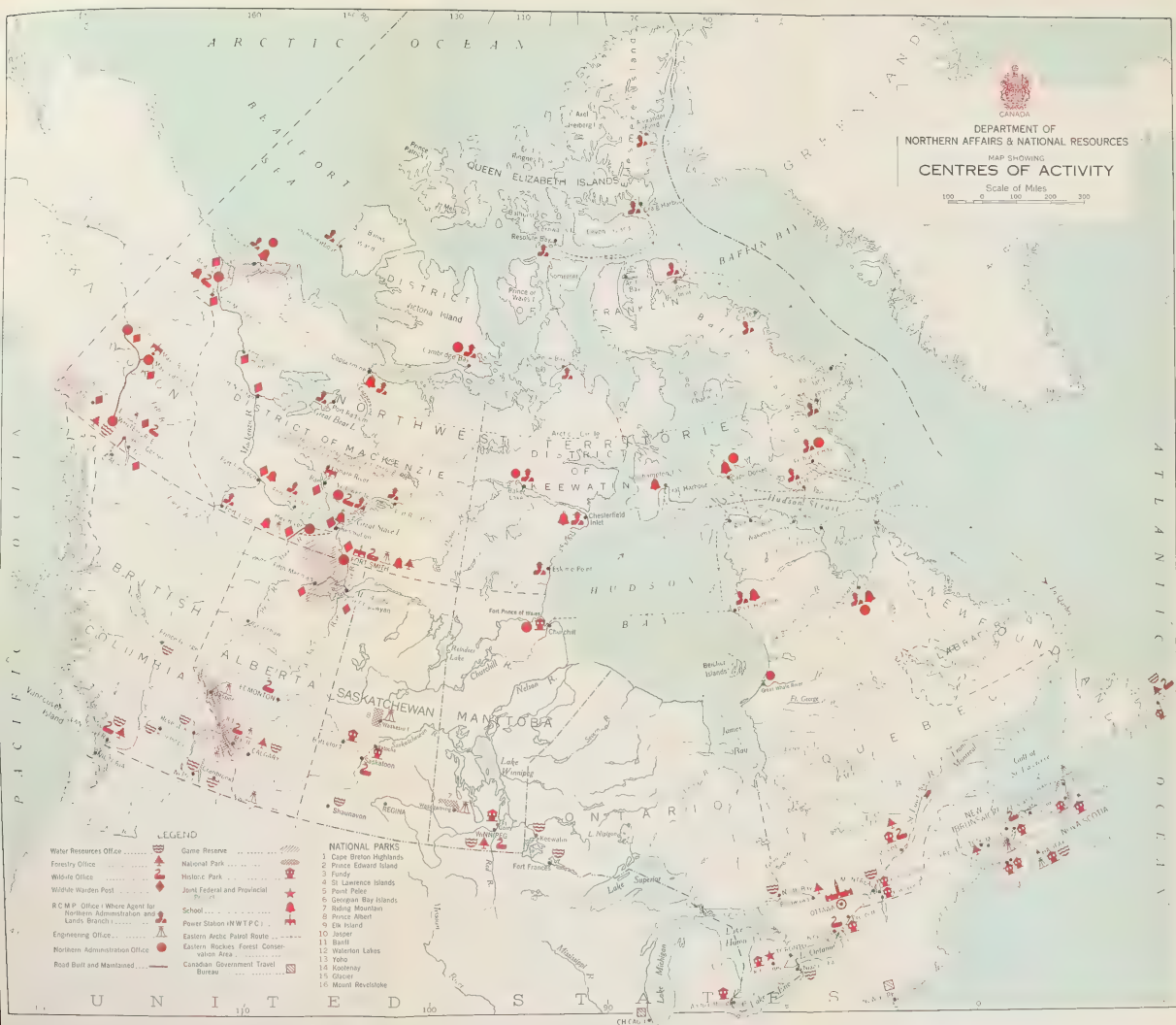


DEPARTMENT OF
NORTHERN AFFAIRS & NATIONAL RESOURCES

MAP SHOWING
CENTRES OF ACTIVITY

Scale of Miles

100 200 300



LEGEND

- Water Resources Office
- Game Reserve
- National Park
- Historic Park
- Joint Federal and Provincial
- School
- Power Station (H.W.P.C.)
- Eastern Arctic Patrol Route
- Maritime Administration Office
- Road Built and Maintained
- Canadian Government Travel Bureau

NATIONAL PARKS

- 1 Cape Breton Highlands
- 2 Prince Edward Island
- 3 Fundy
- 4 St. Lawrence Islands
- 5 Point Pelee
- 6 Georgian Bay Islands
- 7 Riding Mountain
- 8 Prince Albert
- 9 Elk Island
- 10 Jasper
- 11 Banff
- 12 Watkins Lakes
- 13 Yoho
- 14 Kootenay
- 15 Glacier
- 16 Mount Revelstoke

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